VOLUME 8 • OCTOBER 1950 • NUMBER 4

Journal of ORAL SURGERY

AMERICAN DENTAL ASSOCIATION

VOL. 8 • OCTOBER 1950 • NO. 4

A JOURNAL

DEVOTED TO THE ART

AND SCIENCE OF

ORAL SURGERY

JOURNAL OF ORAL SURGERY

Reed O. Dingman, M.D., D.D.S., Editor
221 NORTH INGALLS STREET, ANN ARBOR, MICH.

Journal of Oral Surgery, Vol. 8, No. 4, October, 1950. Published by the American Dental Association, 222 East Superior St., Chicago 11, Ill. Yearly subscription $5.00. Single copy $1.50. Entered as second class matter June 21, 1943, at the post office at Chicago, Ill., under the Act of March 3, 1879. Published quarterly. Copyright 1950 by the American Dental Association. The Journal of Oral Surgery is indexed in Index to Dental Literature and Quarterly Cumulative Index Medicus.

Scientific Articles

FRACTURES OF THE ZYGOMA AND ZYGOMATIC ARCH
George W. Matthews 275

MAXILLARY FACIAL FISTULA
Ronald Grant and George F. Crikelair .. 285

AUTOPLASTY OF ENUCLEATED PREFUNCTIONAL THIRD MOLARS
Harland Apfel 289

TEMPOROMANDIBULAR ANKYLOSIS
James B. Smith 297

NEW TREATMENT OF OSTEOMYELITIS
Orion H. Stuteville 301

GINGIVAL BIOPSY IN DIAGNOSIS OF AMYLOIDOSIS
Irving Meyer 314

X-RAY PROTECTION IN DENTISTRY
Albert G. Richards 323

PTERYGOPALATINE INJECTION FOR BLOCKING THE MAXILLARY NERVE
Leonard Szerlip 327

Case Reports

CONGENITAL ANOMALIES
Sadi B. Fontaine 331

EXTRAORAL REMOVAL OF THIRD MOLAR
Ralph O. Christensen 335

COMPOUND COMPOSITE ODONTOMA
C. D. Gwinn 337

Editorials 339

Surgical Oral Pathology 342

Queries and Comments 349

Book Reviews 351

Announcements 353

1950 Index 355

LON W. MORREY
Editor in Chief of Publications—American Dental Association

REED O. DINGMAN
Editor—Journal of Oral Surgery

EDITORIAL BOARD

Don H. Bellinger, Detroit
H. Newman Brownson, Hollywood, Calif.
James R. Cameron, Philadelphia
Reed O. Dingman, Ann Arbor, Mich.
William E. Durbeck, San Antonio, Tex.
G. Thaddeus Gregory, Indianapolis
Lon W. Morrey, Chicago

CONSULTING EDITORS

J. Orton Goodsell, Saginaw, Mich.
Robert H. Ivy, Philadelphia
Douglas B. Parker, New York
Carl W. Waldron, Minneapolis
V. H. Kazanjian, Boston

ASSOCIATE EDITORS

Lyle F. Aseltine, Chicago
Joseph L. Bernier, Washington, D. C.
Herbert J. Bloom, Detroit
Horace L. Cartee, Miami, Fla.
George W. Christiansen, Detroit
James R. Hayward, Detroit
Frederick A. Henny, Detroit
J. H. Johnson, Toronto, Canada
Merritte H. Maxwell, Annapolis, Md.
Sanford M. Moose, San Francisco
Ralph G. Peterson, Minneapolis
LeRoy W. Peterson, St. Louis
John J. Stetzer, Jr., Philadelphia
Malcolm W. Carr, New York

FOREIGN ASSOCIATE EDITORS

Terrence G. Ward, Sussex, England

VOLUME 8 • OCTOBER 1950 • NUMBER 4 JOURNAL OF ORAL SURGERY

Fractures of the zygoma and zygomatic arch

■ *George W. Matthews, M.S., D.D.S., Birmingham, Ala.*

The frequency of automobile and airplane accidents makes the incidence of fractures of the maxilla and zygoma common. Many of these fractures occur with little displacement of the fragments and no reduction is indicated. The factors which indicate reduction are: (1) diplopia; (2) loss of facial symmetry; (3) interference with jaw function. Diplopia resulting from fractures of the zygoma and depression of the infraorbital ridge may first be noted several days after injury. Authorities agree that reduction should be done within the first week, or earlier if possible.

Many methods have been advanced for the reduction of the displaced zygoma. The *Manual of Plastic and Maxillofacial Surgery*[1] gives seven: (1) antral approach (Lothrop); (2) external approach with towel forceps (Manwaring-Gill); (3) external approach with corkscrew into the zygoma (Roberts); (4) external approach with a curved needle and wire passed around the zygomatic arch and to which traction is applied (Matas); (5) intrabuccal approach in which a small incision is made in the mucobuccal fold and an instrument inserted under the zygoma for elevation (Keen); (6) skeletal traction method in which a screw eyelet is inserted into the zygoma and traction applied by means of the head cap and attachments (Ivy and Curtis); (7) temporal approach (Gillies). These methods are shown in Figure 1.

In handling a large series of these cases, which consisted of military casualties and civilian accidents, the operation advocated by Gillies[2] has proved the most successful.

The temporal incision is made through the skin and the temporal fascia. An elevator guided downward beneath the temporal fascia passes to and under the zygoma. By using the temporal bone as a fulcrum, sometimes aided by a roll of bandage (Fig. 2) a leverage is obtained that is impossible to get from an intraoral approach or with a direct pull from towel

1. *Plastic and Maxillofacial Surgery*. Philadelphia: W. B. Saunders Company, 1942.

2. Gillies, H. D., The Replacement and Control of Maxillofacial Fractures. *Brit. Dent. J.* 71:351 (Dec.) 1941. Gillies, H. D., Kilner, T. P., and Stone, D., Fractures of the Malar-Zygomatic Compound With a Description of a New X-ray Position. *Brit. J. Surg.* 14:651 (April) 1927.

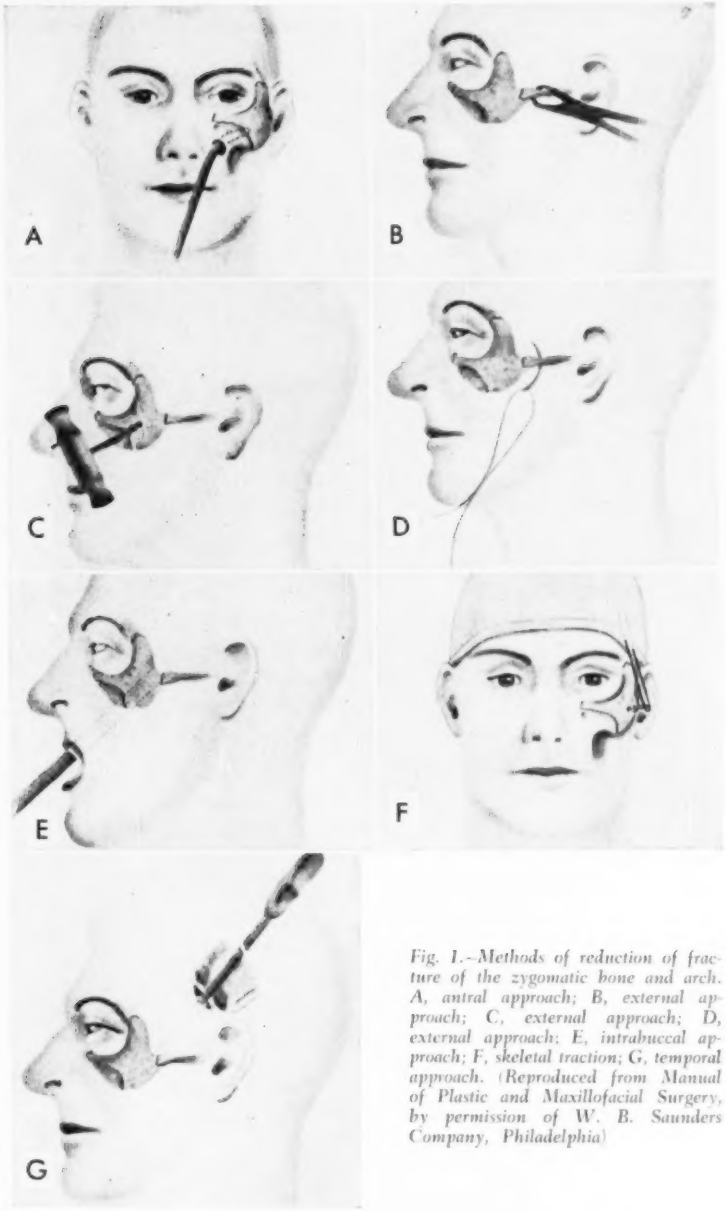


Fig. 1.—Methods of reduction of fracture of the zygomatic bone and arch. A, antral approach; B, external approach; C, external approach; D, external approach; E, intrabuccal approach; F, skeletal traction; G, temporal approach. (Reproduced from Manual of Plastic and Maxillofacial Surgery, by permission of W. B. Saunders Company, Philadelphia)

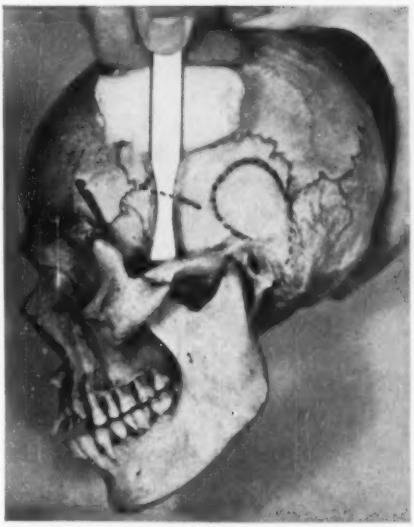


Fig. 2.—Illustrating the powerful leverage that can be obtained by using the skull as a fulcrum and showing the position of the elevator under the zygoma. The outline of the ear is shown and the incision is indicated by the dotted line through which the elevator extends. This shows the incision to be just inside the temporal hairline. If the fracture of the zygoma is further anterior the angle of the elevator is directed forward and if the fracture is back on the zygomatic arch the elevator is directed in a more nearly vertical position. The entire space between the temporal muscle and the temporal fascia can be reached through this incision

forceps, porte-screw or wire. Another advantage of this method over the oral or antral approach is the decreased possibility of infection.

■ *Report of Case*

A man, aged 57, a railroad employee, was injured in January 1946, when the railroad motor car on which he was riding jumped the tracks. He sustained a fractured mandible, a fractured zygoma and a fracture of a cervical spine.

The patient was given first aid, antitetanus, and some small lacerations on his face and chin were sutured on admission to the hospital. Because of swelling about the face, it was difficult to demonstrate a fracture of the maxilla or zygoma by palpation. The alveolar process of the upper jaw was firm. There was a fracture of the mandible at the symphysis with moderate displacement and no loss of teeth. The patient was wearing an artificial eye on the right, so could have no diplopia.

Roentgenographic examination revealed a fracture of the mandible at the symphysis and a fracture of the left zygoma through the infraorbital ridge with overlapping of the fragments (Fig. 3, left).

TREATMENT—The patient was put in a cast for fracture of the cervical spine. An acrylic splint was made for the mandible. This rigidly stabilized the fracture without the necessity of intermaxillary fixation.

With only one eye, diplopia was not a factor. As there was little loss of facial symmetry, it was felt that reduction of the fractured zygoma was not indicated. The patient complained of severe pain on swallowing and stated that he had

difficulty in breathing and "felt like his throat was closed up." Examination revealed that the fracture of the zygoma extended through the maxilla distal to the last molar and involved the palate bone. The bone was depressed medially and downward and was partially occluding the left side of the pharynx. It was freely movable to finger pressure and the patient could feel it move every time he swallowed.

Two days later a Gillies' operation was done under thiopental sodium anesthesia. A 2 cm. incision was made in the left temporal hairline. The temporal fascia was exposed and its fibers separated. An Ivy malar elevator was slipped through this incision in the fascia and downward below the zygoma. This structure was elevated upward and outward. Two gloves had been placed on the left hand, and the left forefinger was placed inside the mouth back against the left side of the palate bone. As the zygoma was elevated outward and upward, this bone could be felt to do likewise. Once in proper position, it remained fixed. Improvement in the patient's respiration was noticed immediately. The contaminated left glove was removed and the wound closed with black silk.

COURSE—The change which the patient noted immediately upon reacting from the anesthetic was spectacular and gratifying. He said that it was the first time he "felt like he could get a good breath since his accident." The fragment showed no tendency to drop back and there was no pain or swelling associated with the reduction.

Figure 3, right, shows the fragments

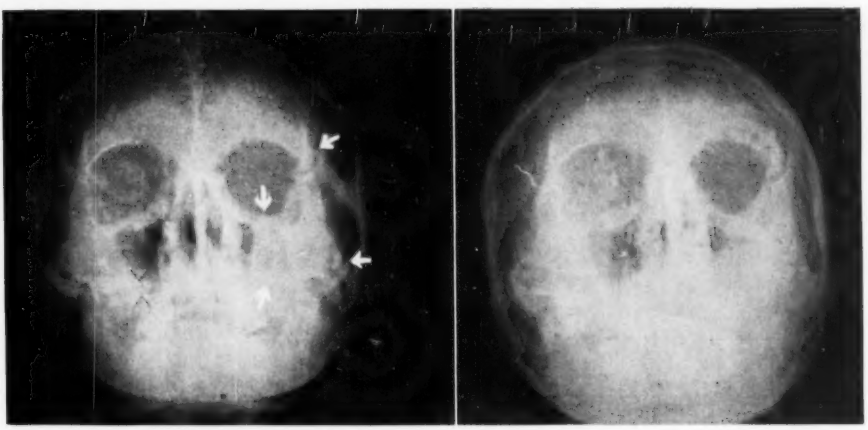


Fig. 3.—Left: Fracture of the zygoma with medial displacement of the lateral fragment and overlapping of the infraorbital ridge. Right: After reduction by Gillies' operation the infraorbital border is symmetrical and the zygomatic arch is out laterally in proper position. The radiopaque mass observed in the left maxillary sinus is due to blood clot

reduced. The radiopaque area observed in the maxillary sinus is due to blood. This absorbed without irrigation.

Five weeks after injury the splint was removed from the lower jaw. The mandible was firm. Occlusion was good. There was no soreness to pressure in the region of the left tuberosity and palate bone nor was there any movement of these bones.

■ *Fractures of the Zygomatic Arch*

The zygomatic arch is small and frail. The reason it is not fractured more often probably is that it is short and well protected by bony prominences in front and behind. It can be fractured only by a direct blow from the side or by forceful trauma to the anterior portion of the zygomatic prominence.

The best diagnostic point in fractures of the zygomatic arch is interference with jaw function as the arch, when driven inward, impinges directly upon the coronoid process of the mandible. Looking for changes in facial symmetry is not always dependable because the depression or deformity immediately after the injury, very shortly becomes obscured by edema.

■ *Report of Case*

A college man, aged 21, received a severe blow on the side of the face while playing football in November 1949. He could not open his mouth. The team physician referred him for examination.

The patient was a husky young man whose cheek bones were particularly high and prominent. There was no abrasion but in the middle of the right zygomatic arch was a depression in which one could lay a thumb. The patient could open his mouth only about 1 cm. and could not move the mandible to the right at all, although he could move it freely to the left.

Roentgenographic examination (Fig. 4, left) revealed a depressed impacted fracture of the zygomatic arch impinging directly upon the coronoid process of the mandible. There were three greenstick breaks which gave the depressed fragment the form of a V with the apex of the V against the coronoid process. This made a difficult type of fracture to reduce as more force would have to be exerted to spring it out than if it were broken in two places with the fragment freely movable.

TREATMENT.—The patient was hospitalized and an operation scheduled for the next day. The following morning the patient's outward appearance gave no indication of an injury, further emphasizing the fact that diagnosis cannot be made on appearances entirely in this type of injury. There was slight swelling over the right zygoma which obscured the depression.

Under thiopental sodium anesthesia the Gillies' operation was done. Difficulty was encountered in slipping the elevator under the depressed fracture as it was apparently impinging directly upon the coronoid process. After one attempt to elevate the fracture was made, a portable x-ray machine was brought in and a roentgenogram was taken which showed unsatisfactory results. Another attempt was made and it was elevated into perfect position as was proved by a second roentgenogram made while the patient was

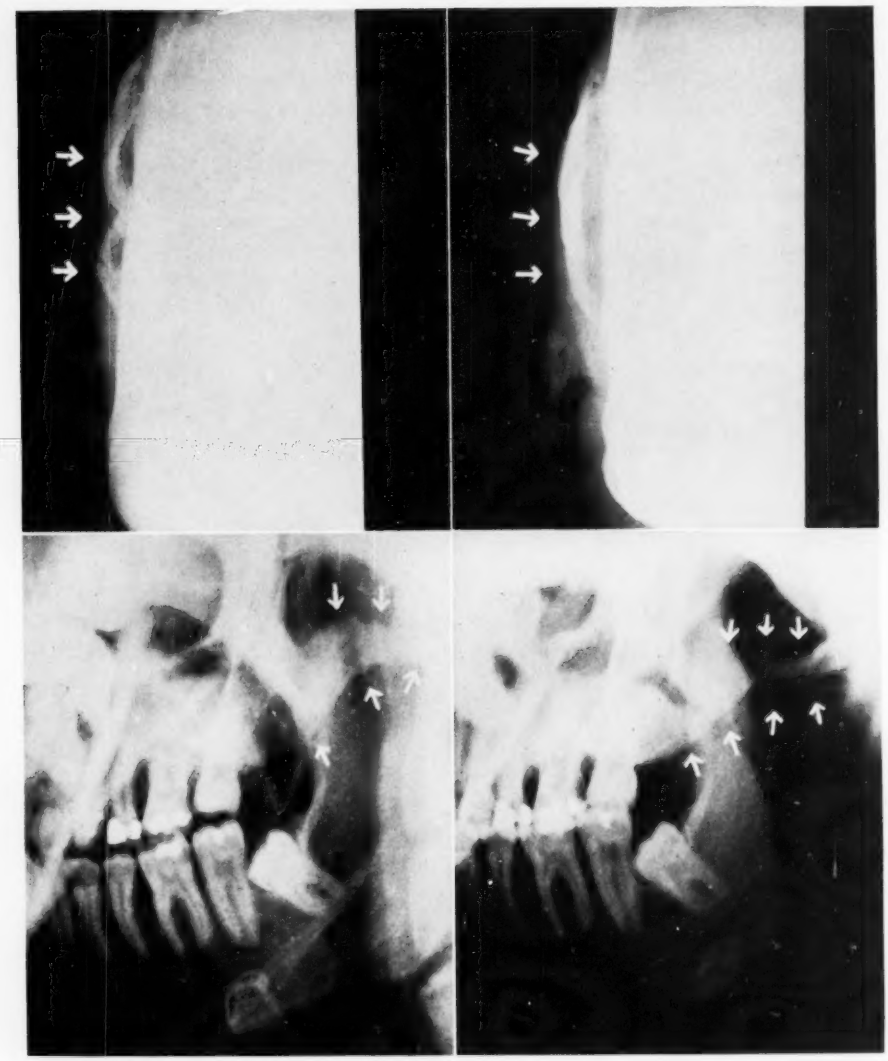


Fig. 4.—Above, left: Projection from below mandible through top of skull showing a depressed impacted fracture of the zygomatic arch with the apex of a V shaped fragment impinging against the coronoid process. Above, right: Postoperative roentgenogram showing perfect reduction and normal symmetry of the arch. Below, left: Laterial view of the jaws showing a depressed fracture of the right zygoma which is apparently broken in three places with a depression inward and upward. Below, right: Postoperative roentgenogram showing reduction and normal outline and contour of the zygoma and zygomatic arch

on the table. A further check into the results of the reduction was made by having the anesthetist open the patient's mouth and swing the mandible from side to side. Closure of the fascia and skin was done as previously described.

COURSE—The recovery was rapid and uneventful. There was no postoperative pain and very little swelling over the right temporal area. The patient could open his mouth fully the following morning and the mandible moved freely from side to side.

Postoperative roentgenograms (Fig. 4, right) showed excellent reduction.

About a week following the operation the patient reported difficulty in opening his mouth as wide as he wanted and also a tightness in the temporal region on moving his jaw to the left. This was ascribed to the formation of scar tissue in the temporal muscle and exercises were prescribed to break up the adhesions. The patient has been observed periodically and jaw function is now excellent.

■ *Complete Fractures of the Zygoma*

When the zygoma receives such a severe blow that it is completely broken loose from its articulations with the frontal, sphenoid, temporal and maxillary bones it is freely movable in several directions and simple reduction is not sufficient. Some means must be devised to hold it firmly in place or it will sag down and result in facial deformity, loss of symmetry and possible diplopia.

Various methods have been used in fixation of the movable zygoma such as direct wiring at the zygomatico-frontal suture; opening the antrum through the buccal approach and packing it tightly with gauze, and so forth. A simple method that involves minimal risk of secondary infection, and provides a firm and positive fixation, is the use of Roger Anderson pins fastened to a head cap or appliance. A case in which this method was used with very pleasing results is reported herewith.

■ *Report of Case*

An ore miner, age 45, was severely injured when a large rock boulder, falling from a considerable height, struck him on the back of the head and drove his face down against a piece of drilling machinery on which he was working. His miner's helmet apparently saved his skull from being crushed. He sustained severe lacerations of the face and multiple compound, comminuted fractures of the facial bones and mandible.

The patient's general condition was so grave for the first few days that only a superficial examination of his maxillofacial injuries was made. The soft tissue wounds were cleaned and closed. He was given the usual supportive treatment and fed intravenously.

Four days later his condition had improved somewhat and it was possible to determine the extent of his injuries. The patient was completely edentulous and both upper and lower artificial dentures had been shattered in the accident. There was a transverse fracture of the maxilla and it was freely movable from side to side and up and down. Although there was severe edema of the face and both eyes were swollen shut, there was a noticeable flattening and lengthening of the right side of the face indicating a depressed fracture of the zygoma. Crepitus

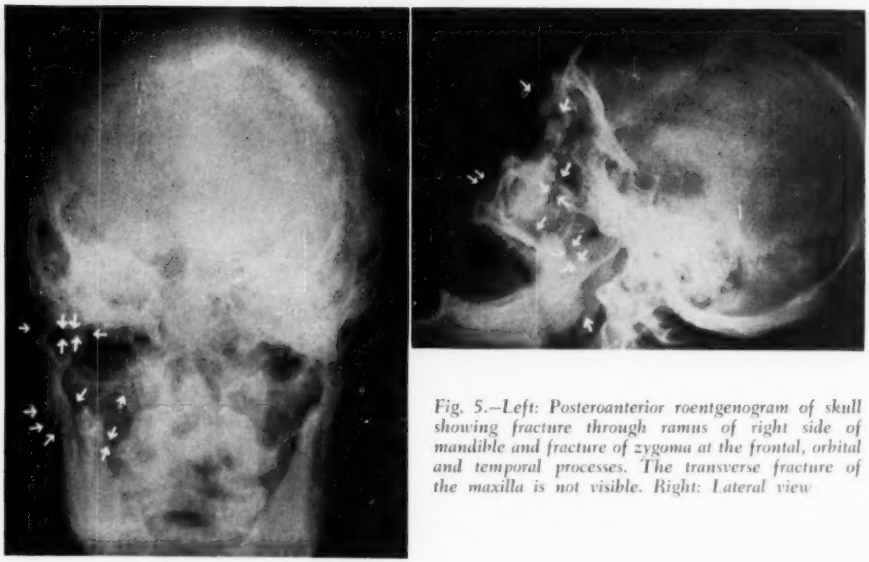


Fig. 5.—Left: Posteroanterior roentgenogram of skull showing fracture through ramus of right side of mandible and fracture of zygoma at the frontal, orbital and temporal processes. The transverse fracture of the maxilla is not visible. Right: Lateral view

could be felt in this area upon palpation. There was tenderness to palpation below the right condyle. There were multiple fractures of the nasal bones and the lacrymal apparatus was injured.

Roentgenographic examination revealed a complete fracture of the right zygoma, a transverse fracture of the maxilla and a fracture through the right ramus of the mandible (Fig. 5).

TREATMENT—As the patient's dentures were broken, other means of stabilizing the maxilla had to be devised. An impression was made of his upper jaw and an acrylic base plate with no palate was constructed. This looked very much like an occlusal bite rim. Square metal tubes were incorporated in each buccal side to receive buccal arms to which was fastened the Woodard[3] appliance and head cap.

The fracture of the ramus of the mandible was high up on the posterior border and open reduction or external fixation was not practical.

Under local anesthesia two Roger Anderson pins were inserted into the symphysis diverging at 60 degree angles, and a horizontal connecting bar was fixed across these two pins. Two more pins were inserted into the zygoma at its maximum prominence and connected with a short bar. These were all fastened to the head cap by means of four long vertical arms (Fig. 6, *A* and *B*). The use of the Roger Anderson pins in conjunction with the head appliance for stabilizing the

3. Woodard, Don E., A Stabilizing Appliance for Treatment of Facial Fractures. *Dent. Digest* 45:263 (July) 1939.

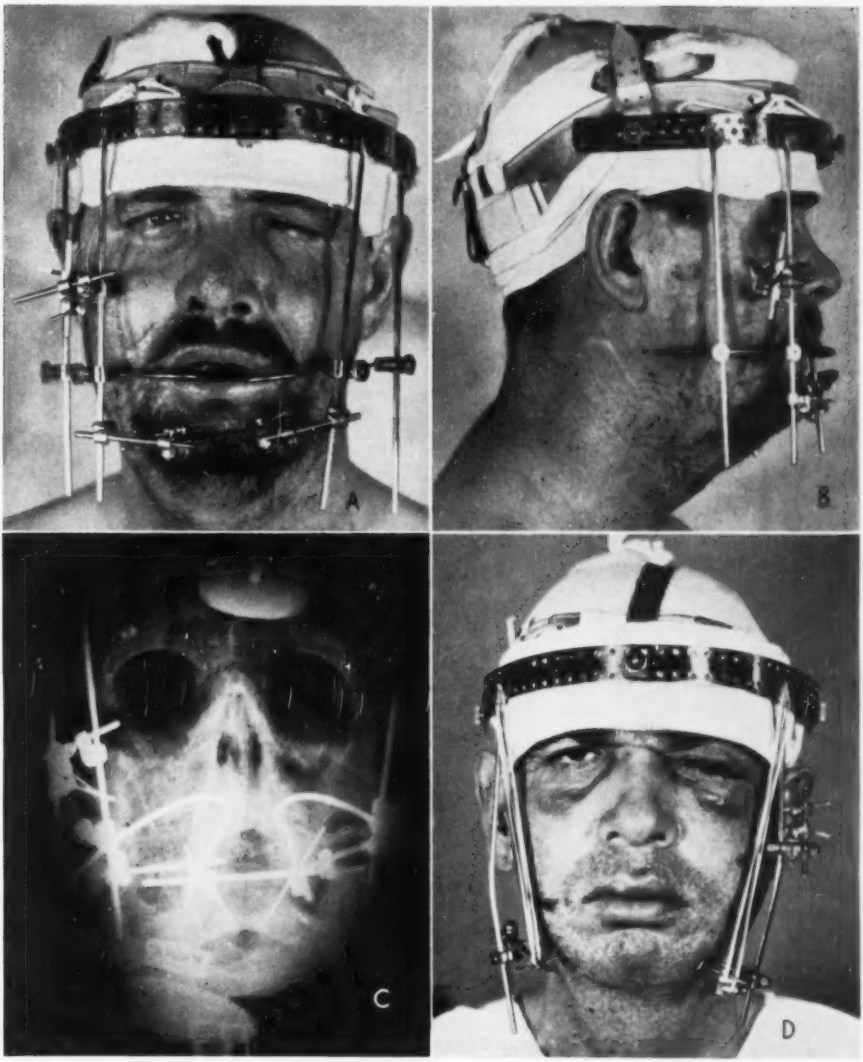


Fig. 6.—A and B: Woodard head cap and appliance with buccal arms for fixation of fractured maxilla and Roger Anderson pins for fixation of the zygoma and mandible. C: Roentgenogram showing appliance in place. Note position and angulation of pins in symphysis and zygoma. D: Photograph of another patient which illustrates the application of elastic traction from the head cap. The patient had a complete depressed transverse fracture of the maxilla and a complete floating fracture of the zygoma.

mandible and zygoma has not previously been reported in the literature.

Nearly two weeks had elapsed since the injury and, since difficulty was experienced in reducing the maxilla manually, so elastic traction was employed. This was used by releasing the thumb screws on the buccal connections with the vertical arms so that the buccal arms would freely slip up and down. An elastic band was hooked over each thumb screw and extended up to the corresponding thumb screw on the head cap appliance. In 48 hours this had pulled the maxilla up into perfect position; the elastics were removed and the thumb screws tightened. Figure 6, *C* is a roentgenogram with the appliance in place showing position of the buccal arms, the pins in the zygoma and the pins in the symphysis of the mandible.

COURSE—The patient was comfortable after reduction and fixation of his facial bones and took a liquid and soft diet very well. There was no discharge or other evidence of suppuration around the pins. As the edema began to disappear the improvement in facial contour obtained by raising the maxilla and elevating the zygoma outward was even more apparent. There was no evidence of diplopia.

The pins were removed seven weeks after injury and both zygoma and maxilla were stabile. The patient was subsequently fitted with new dentures and his jaws functioned as well as ever except for slight limitation on extreme opening.

Figure 6, *D* is a photograph of another patient which illustrates the application of elastic traction. The patient had a complete depressed transverse fracture of the maxilla and a complete floating fracture of the zygoma. Roger Anderson pins in the mandible were used to pull the lower teeth into occlusion with the uppers to reduce and stabilize the fractured maxilla. This is better than the Kingsley splint for two reasons: (1) it is more comfortable than having the arms extending out of the corners of the mouth; (2) controlled occlusion is assured.

After the elastic traction has reduced the maxilla, the appliance is tightened and the elastics are removed.—*1922 Tenth Avenue, South.*

■ Care of Atomic Bomb Casualties

Dr. L. H. Snyder, in the *Medical Annals of the District of Columbia,* in his article "Atomic Bombs over Washington" estimates that casualties resulting from a single atomic bomb explosion over Washington, D. C., would require the services of 5,000 physicians and 60,000 supporting personnel.

Maxillary facial fistula

■ *Ronald Grant, D.D.S., M.S., and George F. Crikelair, M.D., Dearborn, Mich.*

A sinus to the face from the upper jaw is relatively uncommon as is pointed out by Thoma[1] and Mead,[2] and a differential diagnosis must include salivary fistula, actinomycosis and the other granulomas.

In his text *Diseases of the Mouth*, Mead[2] likens fistulas of dental origin to anal fistulas with secondary abscesses in the buttocks. The literature and standard textbooks of oral pathology mention the sites of dental fistulas, the most common being the oral cavity, the maxillary sinuses, the floor of the nose and the face on or about the mandible. Blair[3] described alveolar abscesses discharging in the region of the inner canthus of the eye and the clavicular region while Moorehead[4] demonstrated one in the mammary gland and another in the shoulder.

■ *Report of Case*

A 24 year old white male student entered the Veterans Administration Hospital on December 28, 1948, with a chief complaint of a salivary fistula on the right cheek. He was well previous to June 1947, at which time he noted a moderately tender, non-red swelling of the right cheek associated with a neuralgic type of pain. There was no history of trauma or operative procedure preceding the appearance of the swelling. A diagnosis of spider bite was made by his doctor. Three days later a fistula with a watery, syrupy discharge appeared on the right cheek. Although drainage did not increase with meals, his physician changed the diagnosis to that of a salivary fistula. This drainage was persistent, but the lesion did crust over occasionally for short intervals. No active treatment was instituted until March 1948, when a surgical procedure was carried out for repair of the fistula which was thought to be of salivary origin. Two weeks postoperatively the wound became infected, broke down and again began to discharge. The drainage continued and was still present at the time of his admission to this hospital in December 1948.

Past medical history and systemic review were noncontributory. The patient had served in World War II and had been honorably discharged in 1945. He did not have any illness while in service.

PHYSICAL EXAMINATION—The patient was a well developed, well nourished white male who did not appear acutely or chronically ill. The entire physical examination was within normal limits ex-

Published with permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions or conclusions expressed by the authors.

Section on Oral Surgery, Veterans Administration Hospital, Dearborn, Michigan.

Department of Surgery, Veterans Administration Hospital, Dearborn, Michigan.

1. Thoma, Kurt H., *Oral Abscesses*. Boston: Ritter & Company, 1916, pp. 88 and 157.

2. Mead, Sterling V., *Diseases of the Mouth*, ed. 4. St. Louis: C. V. Mosby Company, 1932. pp. 286-294.

3. Blair, Vilray Papin, *Surgery and Diseases of the Mouth and Jaws*, ed. 3. St. Louis: C. V. Mosby Company, 1917.

4. Moorehead, Frederick B., and Dewey, K. W., *Pathology of the Mouth*. Philadelphia: W. B. Saunders Company, 1925, pp. 86-87.

cept for the presence of a healed 3 cm. horizontal scar over the mid portion of the right cheek (Fig. 1, left). At the most anterior aspect of the scar there was a red, puckered, retracted fistula approximately 2 mm. in diameter. When pressure was applied along Stensen's duct and the right parotid gland a whitish watery exudate was easily expressed. There was no evidence of swelling of the parotid gland. The papillae of both Stensen's ducts were normal. The cervical lymph nodes were not palpable.

A lacrimal probe was introduced into the orifice of the fistula and passed to a depth sufficient to contact the lateral wall of the right maxilla in the region of the bicuspid teeth. Intraorally in the same region a fibrous band was observed which extended from the maxilla laterally and transversely to the buccal mucosa. On palpation this band was moderately dense. Lipiodol was instilled into the sinus tract and at the same time into the right Stensen's duct. A sialogram revealed no evidence of communication between the duct of the gland and the fistula (Fig. 1, right). On roentgenographic examination

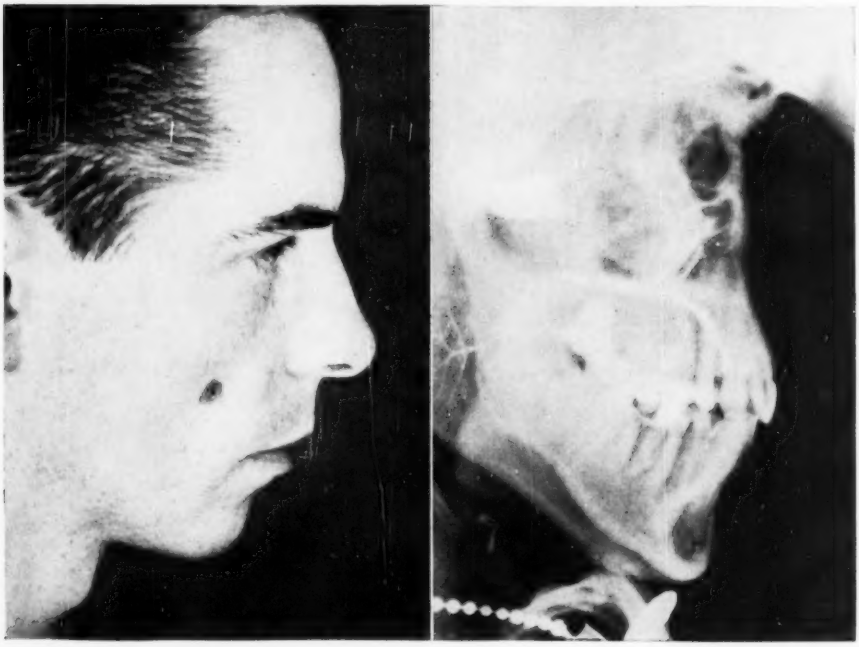


Fig. 1.—Left: Preoperative view of patient showing fistula on right cheek. Right: Lateral sialogram revealed no evidence of communication between Stensen's duct and the fistula. Note pooling of dye in the external fistula

Fig. 2.—Left: Chronic periapical abscesses involving the maxillary right first and second bicuspid teeth. Right: Probe passed through the external opening into the second bicuspid cavity

of the paranasal sinuses a moderate increased density in the right antrum was demonstrated, but there was no communication between the antrum and external fistula visualized when Lipiodol was introduced into the right maxillary sinus.

Intraoral roentgenographic examination indicated chronic periapical abscesses involving the maxillary right first and second bicuspid teeth (Fig. 2, left).

TREATMENT—On January 5, 1948, the maxillary right first and second bicuspid teeth were removed under local anesthesia. Immediately after removal of the teeth a probe was readily passed through the fistula into the spaces formerly occupied by the teeth, thus demonstrating the origin of the fistula (Fig. 2, right). A small petrolatum pack impregnated with a formula of essential oils was placed in the cavity for 24 hours.

The postoperative course was uneventful. In approximately five days there was spontaneous closure of the fistulous opening (Fig. 3, left). Three weeks later it was considered advisable to do a secondary plastic repair, there having been no activity during the intervening period. Under local infiltration anesthesia, the retracted area was excised and a plastic repair was done. A satisfactory cosmetic result was accomplished (Fig. 3, right).

■ *Summary*

The pathogenesis and therapy for dental fistulas are the same regardless of where they appear. Salivary fistulas are rarely spontaneous and are generally the result of calculi, obstruction, or trauma to the duct or face. Fistulas in actinomycosis are usually multiple and observed in the area of the mandible. On occasion patients with persistent dental fistulas are referred for treatment of neoplasms.

In the case reported the original surgical procedure could have been avoided

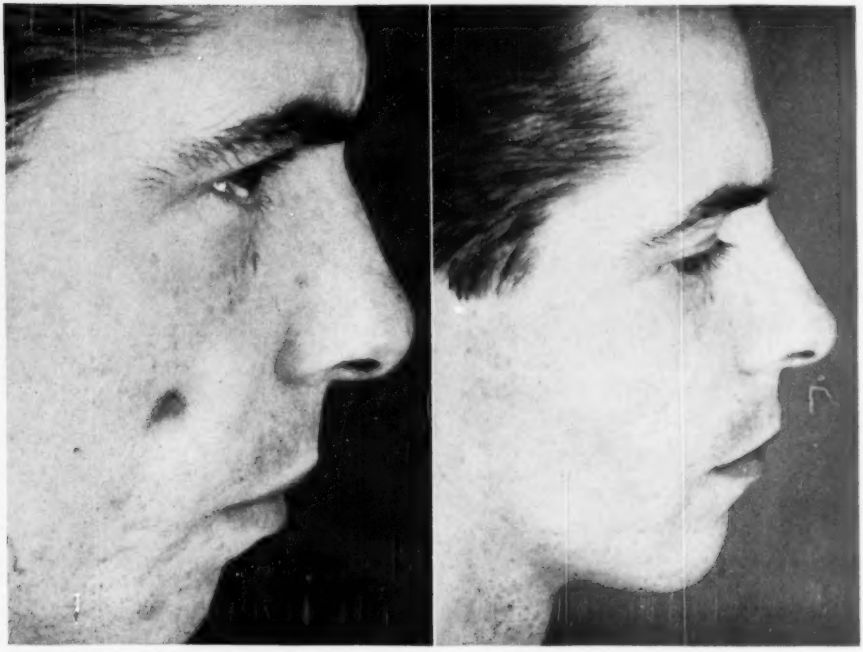


Fig. 3.—Left: View of fistula five days after removal of teeth. Right: Final result four months after plastic repair

had a sialogram and dental roentgenographic examination been carried out preoperatively.

It may be necessary to resort to a number of diagnostic procedures to determine the origin of a facial fistula and the differential diagnosis should include a fistula of dental origin.

There is endless merit in a man's knowing when to have done.—*Carlyle.*

Autoplasty of enucleated prefunctional third molars

■ *Harland Apfel, D.D.S., San Pedro, Calif.*

Members of the dental profession have tried diligently to stop the collapse of the dental arches following the loss of one or more permanent first molars during adolescent life. The immediate autogenous replacement of these important teeth with live young prefunctional third molars, has met with enough success in the prevention of this crippling malady to warrant further investigation. It is the purpose of this paper to present some of the interesting high lights of this research as well as to report in detail the surgical procedure found most useful at the present time. If this preliminary report can inspire oral surgeons to seek new and better technics to accomplish this logical problem, then it will be worth-while.

The several technics tried during the past five years have met with varying degrees of success. The procedure shown here violates few physiological processes of tooth eruption and is concomitant with good surgical principles.

In effecting the procedure, the third molar is truly enucleated before it is used as a plastic replacement of the first molar which encourages the name "odontoenucleation with autoplasty."

Patients range from 13 to 19 years of age. The tooth supporting alveolar bone should be free from paradentosis. In the first molar area, the bone in the alveolomandibular or alveolomaxillary junction should be spacious enough to act as host to the dental organ which is to be used in plastic replacement of the lost permanent first molar. This bone area should be free from acute infection, but need not be free from chronic osteodestruction such as results from granulomas, chronic abscesses, or cysts.

Most "teen aged" patients fall within the acceptable range if they have a doomed permanent first molar or have recently lost a permanent first molar without gross tipping of adjacent teeth. Since all teeth make their normal oral appearance at a definite time during their growth and development, it is wise to institute surgical intervention just prior to that strategic time if possible. Roentgenographic examination should reveal a third molar, little as or no larger than the first molar it is to replace. The third molar's roots should have started development to a point of bifurcation, which should be equal to a root development of 2 or 3 mm. This is just prior to that time when the molar would normally make its oral appearance.

Each normal unerupted tooth is enclosed in its dental sac which finds itself completely encased in a dense bony crypt, except where the occlusal part of the follicle is connected to the overlying mucous membrane on the crest of the ridge by a gubernaculum. The dental follicle is attached to the surrounding bony crypt by minute fibrils and a network of fine

Fig. 1.—Enucleated young third molar with operculum, gubernaculum and follicle intact

capillaries. When this entire dental organ is enucleated from its crypt, it makes splendid material for autoplasty in the space vacated by the first molar (Fig. 1).

In all operations I have used thiopental sodium and oxygen anesthesia.

■ *Surgical Procedure*

With a sharp pointed applicator, deposit a minute quantity of gentian violet on the gingiva immediately distal to the second molar. This will identify the mesial edge of the operculum over the third molar. The primary incision is started upon the anterior surface of the ramus of the mandible and extended mesially along the buccal surface of the alveolus to the region of the first bicuspid, where it is deflected toward the mucobuccal fold (Fig. 2, *A*). The second incision originates in the same place as the first incision, but extends toward the linguogingival crest of the mandibular teeth to the first bicuspid. This lingual flap is not deflected. The gingival tissue is freed from the distal of the second molar with a hoe-like instrument. This leaves a triangular piece of mucoperiosteum, just distal to the second molar, which is the operculum and is attached to the underlying third molar follicle by its original dental cord or gubernaculum (Fig. 2, *A*). With osteotomes sufficient distal and buccal bone is removed from the third molar area to allow complete enucleation of the dental organ (Fig. 2, *B*). A curet or small root pick is a satisfactory instrument. Removal should be accomplished with gentle care. The enucleated dental organ should be inspected for size and character, after which it is allowed to tip back into its original crypt to await the removal of the first molar and the preparation of its new home.

■ *Bone Preparation*

About 3 mm. of buccal bone are removed from the roots of the diseased first molar. The molar is then tipped out of the socket. All of the interceptal bone is removed with osteotomes and the lamina of bone lining the socket is completely removed (Fig. 2, *C*). A small portion of the lingual crest of bone is removed to allow sufficient room for the lingual bulge of the new tooth crown. The submaxillary gland lies in a concavity of the medial surface of the mandible, causing a narrowing of the mandible body in the molar region. If the third molar dental organ is placed well within the confines of the alveolomandibular junction, it is sometimes necessary to remove a small portion of the medial plate of bone of the mandible in the region of this concavity (Fig. 2, *D*). The newly formed bone cavity will hemorrhage freely. Pulsating arterioles should be oc-

cluded with a blunt instrument. The already enucleated third molar is then lifted from its original crypt and carefully lowered into its new home in such a way as to allow the operculum to replace the neck of the first molar. The gentian violet dot now identifies the mesial of the enucleated tooth. The wound is closed with three or four sutures, one of them being placed directly across the occlusal of the newly placed third molar (Fig. 2, *E*). Healing by first intention usually occurs.

A temporary all acrylic splint is made to fill the place formerly occupied by the first molar crown (Fig. 3). This should be accomplished during the first or second postoperative week. In young patients the opposing molar will quickly move unless retarded by an occlusal barrier. While preventing occlusal drift of the opposing first molar, the splint also helps keep the adjacent bicuspid and molar upright. As the third molar makes oral appearance during the subsequent months, the splint may be cut away from time to time to allow occlusal growth. When the third molar has reached occlusal alignment, the splint may be discarded.

■ *Discussion*

Not only does the enamel forming part of the dental follicle complete the calcification in the enamel, but also is

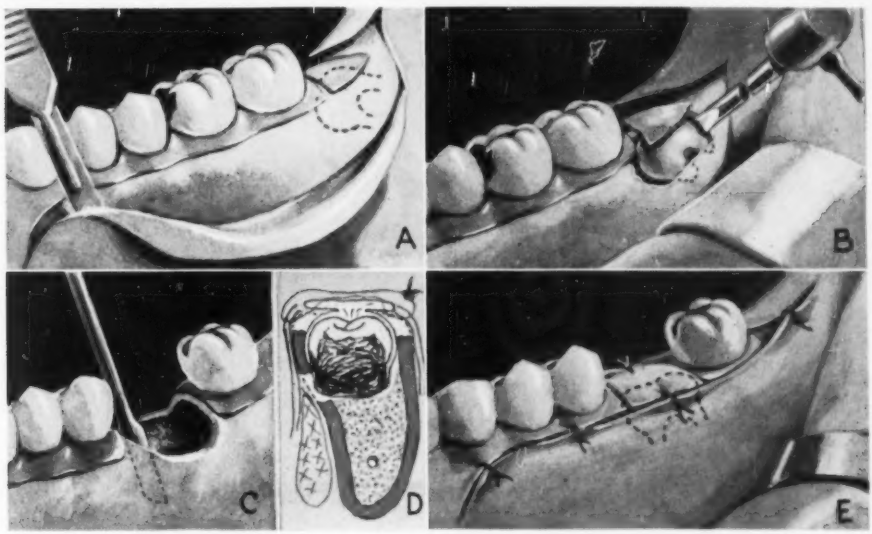


Fig. 2.—A: Drawing showing the primary incision. The triangular piece of mucoperiosteum distal to the second molar is also visible. The dotted lines represent the third molar follicle. B: Sufficient bone is removed from the area to allow complete enucleation of the dental organ. C: First molar socket is prepared. D: The third molar dental organ is placed well within the confines of the alveolomandibular junction. E: Autoplasty complete, sutures placed

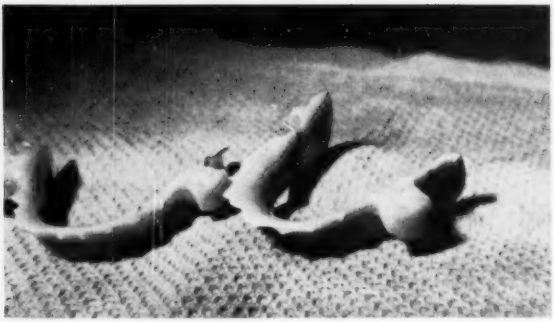


Fig. 3.—The temporary splint maintains chewing function, and prevents tooth tipping. It should be inserted during the first or second postoperative week

a forerunner of Hertwig's sheath, and consequently initiates formation of the root itself.[1] Calcification of the enamel is not complete until root formation has started. Since root development cannot occur without Hertwig's sheath, it is imperative that a healthy dental follicle be maintained until 2 or 3 mm. of root have formed. After that time continued root formation is a self-propelling activity. On some occasions the occlusal part of the dental sac is ruptured during the operation; this is followed by a sloughing of that same occlusal part during the first two postoperative weeks. If ruptured before root formation has well started, there will be no root.

In 1946, 5 cases were operated on before root growth of the third molar was evident in a roentgenogram (Fig. 4, *A*). They were well buried in the bone (Fig. 4, *B*). All were naturally slow in development and only partial roots are evident to date (Fig. 4, *C*). During the same year 4 similar cases were treated, with the exception that the third molars were not deeply buried in the bone (Fig. 4, *D* and *E*). They remained attached to the superficial gum tissue for two years and served as excellent space retainers, but roots did not develop (Fig. 4, *F*). They were subsequently removed. Ten other cases were also operated on in 1946, after root growth of the third molar was well started (Fig. 4, *G*). These were buried deep in the bone (Fig. 4, *H*). All 10 teeth are now in chewing function. They show developing roots, and what appears to be a healthy gingival crest of bone. (See Fig. 4, *I*.)

It is advisable to establish a new home in the bone to accept the third molar dental organ in which it can develop a crypt comparable to the crypt in which the tooth resided before its enucleation. The new surgically prepared home should not be made so large as to allow a thick clot of blood to exist around the new tooth, nor should it fit so snugly as to receive pressure from the surrounding bone, which will cause a gnarling of the roots. The roots of the new tooth will be but little longer than the distance the

1. Orban, Balint, *Oral Histology and Embryology*, ed. 2. St. Louis: C. V. Mosby Company, 1949.

tooth travels to its occlusal line, and will be comparable to the roots of the contralateral third molar. While it is believed that interference with proliforating epithelial cells in the early part of their formation might cause gross malformations, surgical intervention at this time in the life of a developing tooth is not a precursor of tumor growth.

Among other cases treated in 1947, one case which was operated on June 27, 1947, was only seen upon two immediate postoperative visits. The patient did not even return to his dentist for future operative dental care. On January 19, 1950, because of odontalgia, the patient visited his dentist and the third molar, then in chewing function in the first molar position, was removed.

The photomicrograph identifies the development of pulp, dentin, cementum (Fig. 5, left), and what we choose to term the neosurgical line (Fig. 5, right). The neosurgical line is not unlike the neo-

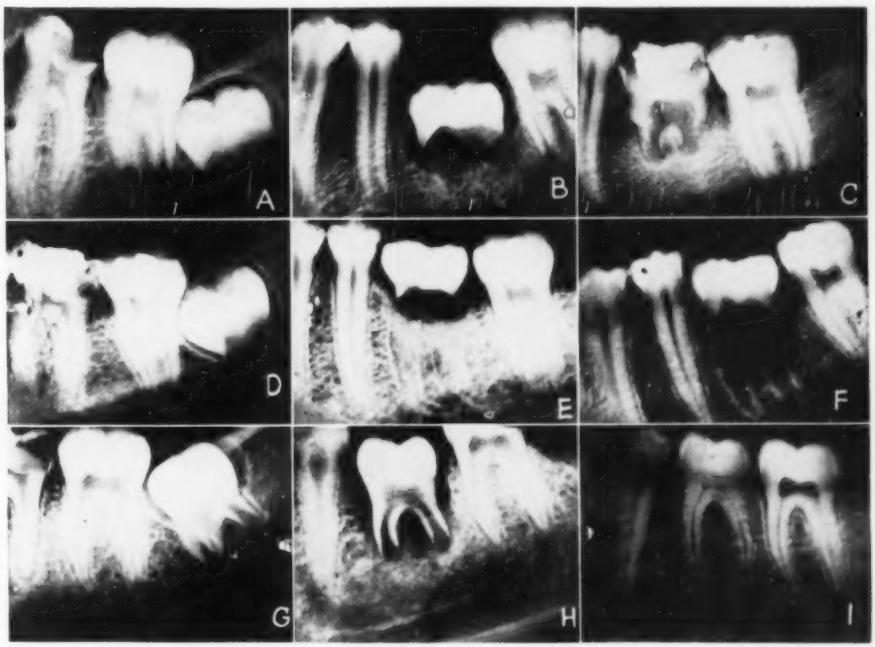


Fig. 4.—A: Third molar roots have not started to grow. B: Transplanted into first molar position; well buried in the bone. C: Four years after surgery. Note malformation of roots and pulp chamber. D: Third molar follicle similar to one shown in A. E: Third molar was not buried deep in the bone. F: Four years after surgery. Roots failed to develop. G: Root growth of third molar is well started. H: Three months after surgery, the third molar is developing. I: Four and a half years after surgery, the tooth is in good chewing function, and appears to be healthy

Fig. 5.—Left: Upper right corner is dentin. Center mass is pulp tissue with capillaries containing red blood cells. Right: Bulging growth ring with neosurgical line extending horizontally across center, separating old dentin above from new dentin below

natal line in deciduous teeth.[2]

Roentgenograms of all teeth, which have undergone such surgical stimulation, show evidence of a growth ring on the roots (Fig. 6). These growth rings indicate the extent of development before surgical intervention. A careful study of normal adult bicuspids will show similar, but less evident, growth rings and curvatures of roots which occurred because of stimulation incident to removal or shedding of deciduous molars.

While several homogenous replacements have been accomplished, the results are inconclusive and at the present time rather doubtful.

The loss of a permanent first molar, when the individual is between the ages of 13 and 19, is completely crippling. Its immediate replacement is imperative. The procedure outlined in the foregoing paragraphs is adaptable to both maxillary and mandibular losses.

Nuckolls[3] has reported in the literature:

> In our work we have been able to cultivate successfully *in vitro* tooth germs from the unerupted molars of one-day-old rats and mice for considerable lengths of time. These experiments essentially confirm the work of Glasstone. They establish the fact that odontoblasts, once determined, form dentine, but if the enamel epithelial elements have undergone degeneration, the deposition of this dentine is highly irregular. On the other hand, if the enamel epithelium is maintained, the gross morpho-

2. Schour, Isaac. The Development and Growth of the Teeth. *Oral Surg., Oral Med. & Oral Path.* 1:346 (April) 1948.

3. Nuckolls, James. Lobular Development and Calcification in the Tooth. *J. California D. A.* 17:73 (May-June); 17:105 (July-Aug.) 1941.

logical characteristics of the tooth are reproduced.

A further and most important observation is the finding that in these prolonged *in vitro* experiments the tooth germ reorganizes for itself a complete bony crypt. This was especially interesting in view of the fact that at the time of removal of the germ of the second molar the tooth rudiment is surrounded by undifferentiated mesoderm exhibiting as yet none of its osteogenic potentialities. . . . In addition, it is interesting to note that the bony crypt so formed completely surrounds the tooth, roofing its occlusal surface.

These observations would seem to indicate that the external enamel layer is in some way related to the establishment of the crypt and to the bony elements in a much more intimate manner than heretofore suspected. This may throw some light on the active phase of tooth eruption, and is suggestive with regard to a possible mechanism of this little-known process. . . . There is ample evidence to suggest that the process of eruption is far more complex than earlier work has assumed. One of these factors has been brought out by Grüneberg in his analysis of a grey-lethal mutation strain occurring in the mouse. In this strain, although the teeth are normally developed, they fail to erupt. Grüneberg has, therefore, proposed that there is some relationship between pressure and absorption of bone, which mechanism is upset through the operation of hereditary factors in this particular mutation.

. . . From our evidence the emphasis is carried more and more toward the conception that tooth eruption is an active rather than a passive process.

While several homogenous replacements have been accomplished, the results are inconclusive and at the present time rather doubtful.

■ *Summary*

1. The immediate replacement of permanent first molars with live prefunctional third molars in "teen aged" patients has met with sufficient success to warrant further investigation.

2. Tooth structure will continue to grow and form its own new bony crypt followed by root and pulp development subsequent to autoplasty.

3. After working with several surgical technics the most successful as used today is here recommended.

Fig. 6.—Third molars replacing first molars now in function more than three years. They were slightly sensitive during cavity preparation. Growth ring appears as a slight bulge on the root

4. Institution of surgical intervention just prior to oral appearance of the third molar does not grossly interfere with continued normal tooth development.

5. The placement of a temporary splint aids in maintaining normal tooth alignment in the immediate postoperative period.

6. An appraisal of the histologic and morphologic differentiation of the developing third molar helps in understanding logical coordination between surgery time and tooth development.

7. A study of some of the cases operated on during the past five years, gives rise to some definite decisions about surgical procedure in replacing the first molar with a live young third molar.

8. Roentgenographic evidence of 2 or 3 mm. of root on the third molar indicates a completion of enamel calcification and heralds the time of normal oral appearance.

■ *Conclusion*

If a third molar can successfully replace a first molar in "teen aged" patients, it must fulfil certain requirements.

1. The third molar crown must successfully replace the first molar for many years.

2. The roots of the third molar must continue to grow to a normal conical apex.

3. Roentgenographic examination during subsequent years must reveal normal bone surrounding the tooth roots including a well established cortical crest.

4. The periodontal membrane space should be evident surrounding the root.

5. The tooth should respond favorably to vitality tests.

6. The tooth should have a good color.

7. The space normally occupied by the permanent first molar should be maintained by the third molar.

I pity no man because he has to work. If he is worth his salt he will work. I envy the man who has a work worth doing and does it well.—*Theodore Roosevelt.*

Temporomandibular ankylosis

■ *James B. Smith, D.D.S., Danville, Pa.*

Though not a hazard to life itself temporomandibular ankylosis may be a serious hazard to the physical health and happiness of the individual. What this condition lacks in importance to society in general because of its infrequent occurrence, it makes up in importance to the patient so afflicted. The combination of a strikingly abnormal, chinless facial appearance plus the inability to take any solid food whatsoever plus pain from infected teeth which cannot be removed amounts to a severe handicap. The fact that half the patients so afflicted are reported[1] to receive proper treatment only after 10 years of ankylosis suggests a general lack of knowledge of the good results of surgical treatment.

Temporomandibular ankylosis consists of partial or complete immobility of one or both joints owing to lesions located within or surrounding the joints. Classification has been attempted according to location of the lesion and whether the ankylosis results from bony union or fibrous union of the members of the joint.

Intra-articular ankylosis may result from union of the condyle of the mandible with the glenoid fossa of the temporal bone. This union may consist of a direct fusion of the two bones or it may be a fibrous tissue union. In the latter case there may be some movement in the joint.

Extra-articular ankylosis results from scar tissue binding the mandible to the zygoma or the maxilla. It may also be due to bony union of the coronoid process of the mandible to the zygoma following penetrating wounds of the side of the head.[2] A combination of intra-articular and extra-articular ankylosis may also occur.

■ *Etiology*

Approximately one half of all cases of temporomandibular ankylosis occur before the age of 10 years, but the usual age of the patient at time of treatment is 20 to 30 years. Thus most patients have had ankylosis for many years before surgical treatment. Under these conditions it is difficult to get reliable data on events preceding onset of the ankylosis. However, trauma to the chin with or without fracture of the mandibular condyles and acute infections about the teeth and temporal regions with abscess formation seem to account for most cases of ankylosis. The acute febrile diseases such as scarlet fever, measles, diphtheria, tonsillitis and typhoid fever seem to precede ankylosis in many cases. Rheumatoid arthritis occasionally attacks the temporomandibular joint resulting in loss of function of the joint. Extension of infection from middle ear disease is not as common as might be ex-

From the Department of Oral and Maxillofacial Surgery, Geisinger Memorial Hospital, Danville, Pennsylvania.

1. Henderson, M. S., and New, G. B., Ankylosis of the Jaw. *Surg., Gynec. & Obst.* 27:451, 1918.

2. Brown, J. B., and others, Ankylosis of the Coronoid Process of the Mandible (and Associated Scar Limitation of Jaw Function). *Plast. & Reconstruct. Surg.* 1:277, 1946.

pected from the anatomic proximity of the middle ear to the joint and the frequency of suppurative infections of the ear. Henderson and New[3] found no instance of middle ear infection associated with the 23 cases they reported. However, Eggers[3] reported a case of ankylosis secondary to mastoiditis in a four year old girl. Thoma[4] reported a case of ankylosis following birth injury in which the infant's ear was also lost through forceps delivery.

■ *Pathology*

The development of ankylosis in the human patient is a slow and probably painless process following the initial injury or infection. Allison and Brooks[5] have described the pathologic changes seen in ankylosis produced experimentally in dogs. Ankylosis in man probably follows the same pattern. These investigators partially excised knee joints in dogs, destroyed the entire joint cartilage, injured the cartilage and infected normal joints with staphylococcus and tubercle bacilli. The dogs were then sacrificed and microscopic examinations were made of the joint structures. From these experiments Allison and Brooks[5] concluded that any inflammatory process or injury severe enough to produce granulation tissue within the joint space will destroy the joint cartilage and result in ankylosis. Destruction of the cartilage may occur from granulation tissue in the joint space or from granulation tissue within the bone marrow spaces. Union between the members of the joint is first by granulation tissue which matures to dense fibrous tissue which undergoes metaplasia to fibrocartilage and finally to bone. In the dog this entire process requires 180 days. In the human being the development of ankylosis is probably even more prolonged.

■ *Symptomatology*

The symptoms of ankylosis are surprisingly mild. The onset of the disease usually passes unnoticed or is overshadowed by the more urgent symptoms associated with the trauma or infection which gave rise to ankylosis. Pain is not a prominent complaint unless the teeth are infected. However, since dental hygiene is usually neglected and treatment by the dentist impossible, some patients seek help for the ankylosis only because of pain from carious teeth. It is of course necessary to relieve the ankylosis before removing the teeth.

■ *Diagnosis*

The observations on examination will depend in part on the age of the patient when ankylosis developed.[6] If the ankylosis began during infancy or at any time up to full development of the mandible at about 15 years of age there will be severe or moderate facial deformity and the teeth generally will be hopelessly carious. If ankylosis develops after 15 years of age, however, little or no disturbance in the shape of the mandible will be found, and the teeth may be well preserved since the patient had passed through the period of most active dental caries before dental hy-

3. Eggers, G. W. N., Arthroplasty of Temporomandibular Joint in Children With Interposition of Tantalum Foil; a Preliminary Report. *J. Bone & Joint Surg.* 28:603, 1946.

4. Thoma, K. H., Ankylosis of Mandibular Joint. *Am. J. Orthodontics (Oral Surg. Sect.)* 32:259, 1946.

5. Allison, Nathaniel, and Brooks, Barney, Ankylosis, An Experimental Study. *Surg. Gynec. & Obst.* 19:568, 1914.

6. Dingman, Reed O., Ankylosis of the Temporomandibular Joint. *Am. J. Orthodontics (Oral Surg. Sect.)* 32: 120, 1946.

giene had to be given up. Whether ankylosis is complete or partial, some little movement usually persists in the mandible, and it may be easy to decide which of the two temporomandibular joints is affected, since there will be definite deviation of the chin toward the affected side on attempting to open the mouth. This deflection toward the ankylosed joint is due to the sliding movement of the condyle on the unaffected side. In those cases which occur before development of the jaw is complete two other points will aid in deciding which joint is affected. The horizontal ramus on the normal side will be flattened while the affected side seems more normally curved. The angle of the mandible on the affected side is usually extended downward forming a definite notch in the inferior margin of the mandible which is easily palpated. Roentgenograms of the temporomandibular joints will show obliteration of the affected joint by a huge mass of dense bone, and will clear up any doubt about involvement of both sides.

If the ankylosis is due to extra-articular cicatrization there will be nearly normal lateral and anteroposterior movement of the jaw and roentgenograms will show normal joint detail. If ankylosis is due to fusion of the coronoid process of the mandible with the zygomatic arch there may be a history of a penetrating wound and a roentgenogram may demonstrate the lesion.

■ *Treatment*

The only satisfactory treatment of temporomandibular ankylosis lies in a surgical operation to create a new joint in the ascending ramus of the mandible. John B. Murphy[7] in 1916 described this form of arthroplasty as "one of the most gratifying in bone and joint surgery as far as results are concerned, and one of the easiest of execution." And yet despite long standing knowledge of proper forms of treatment we still hear of the old practice of submitting these patients to general anesthesia and forceful opening of the jaws in the hope of breaking down the fibrous tissue within the joint and allowing normal function of the mandible. This procedure must fail to relieve the ankylosis and will surely result in more scar tissue within the joint.

Arthroplasty in ankylosis of the temporomandibular joints consists of removal of a section of the ascending ramus just below the ankylosed joint in order to create a form of flail joint. Various operations have been devised to prevent reunion of the mandible to the temporal bone by interposing fascia lata, cartilage, pedicle flaps of masseter muscle and tantalum foil. However, Dingman[8] has shown that interposition of flaps or foreign material is unnecessary and that reunion will not occur if a section of ramus at least 2 cm. wide is removed. Special precaution must be used in order to protect the facial nerve, which lies below and lateral to the section of mandible to be removed, and the internal maxillary artery, which lies medial to it. The incision is made along the anterior margin of the external ear and carried upward and forward over the zygomatic arch in a semicircle. The flap of skin and fascia thus outlined is elevated to expose the zygomatic arch. The masseter muscle is then detached from the zygoma and the

7. Murphy, John B., and Kreuscher, P. H., Ankylosis of the Jaw. *D. Cosmos* 58:160, 1916.

Record of patients treated for temporomandibular ankylosis

Age at onset	Age when treated	Etiology	Remarks
1 year	15 years	Trauma	Fell down stairs
1 year	14 years	Unknown	Unsuccessfully treated by forceful opening of mouth under general anesthesia
23 years	33 years	Rheumatoid arthritis	Complete invalidism
1 year	27 years	Diphtheria, scarlet fever, otitis media	Bilateral mastoidectomy
1 year	6 years	Trauma in fall from crib	Unsuccessfully treated by forceful opening of mouth under general anesthesia

joint exposed. Chisels, drills and rongeurs are used to remove a section of the ascending ramus at least 2 cm. wide. A flap of masseter muscle may be used to fill the space created by the removal of bone, and the wound is then closed. Some movement of the mandible will be possible the day after the operation, but exercise and mild dilating appliances will be necessary to obtain the best possible results. If ankylosis is bilateral the second joint may be operated on about one month after the first operation. This delay is advisable in order to prevent retrusion of the mandible which may occur if both joints are operated on at the same time.[6]

After movement of the mandible has been restored it will usually be necessary to remove all of the teeth and construct artificial dentures. The prominence of the chin may also be restored by cartilage implant.

■ *Review of Cases*

A review of Geisinger Memorial Hospital records reveals only five patients, among the 180,000 registered, who have been treated for temporomandibular ankylosis. The Table shows approximately the same age of onset, age when treated and etiologic factors reported in the literature.

■ *Summary*

Temporomandibular ankylosis is a pathologic state resulting from trauma or infection in or about the temporomandibular joints. The only successful treatment for this condition is a surgical operation. This procedure is not a dangerous one and the results are uniformly satisfactory. The long delay between onset of ankylosis and successful treatment by arthroplasty suggests a general lack of knowledge of the good results of treatment.

A new concept of treatment of osteomyelitis of the mandible

■ *Orion H. Stuteville, D.D.S., M.D., Chicago*

The treatment of osteomyelitis of the mandible, a disease as old as medical science, has always been a serious problem. The old treatment, which consisted of drainage and watchful waiting, usually permitted the disease to run a course varying from several months to several years. During all this time the patient was incapacitated. By the use of chemotherapy and antibiotics, combined with surgical treatment, the progress of infection can be controlled, and the course of the disease shortened from years to a few weeks.

The tendency of osteomyelitis toward chronicity is owing to the histologic or histochemical makeup of the bone. Bone is formed by a few cells with a large amount of intercellular substances. When infection invades the soft tissue there is hyperemia, swelling, thrombosis of the vessels and necrosis of the cells. Leukocytes are poured into the region. Proteolytic enzymes are liberated which liquefy the necrotic cells and intercellular substances, forming a pus cavity or abscess.

The walls of the abscess are formed by damaged tissue but still contain living cells, leukocytes and macrophages. Here the battle between the invading bacteria and the body defense goes on. The best way to tip the balance in favor of the defense is to remove the invading organisms; if an abscess is present incision and drainage is the best treatment. The sulfonamide drugs and the antibiotics retard the reproduction of the bacteria, or, in high concentration, kill them.

After the abscess and soft tissue are drained, either spontaneously or by incision and drainage, or are absorbed, and the invading organisms removed or killed, the walls collapse and come together. The space is then healed by the formation of granulation tissue which seals the surfaces or fills in the space. The granulation tissues are replaced by connective tissues which form the scar.

When bone is invaded by infection, the process is identical until the stage of liquefaction is reached. There is pus formation because of necrosis of the cells of the bone and a collection of tissue fluids and leukocytes in the area. In other words, the bone becomes necrotic but it still retains its shape since the calcified intercellular substance is not liquefied. The extent of the process depends upon the virulency of the invading organism and the resistance of the patient. In a typical advanced case of osteomyelitis of the mandible, where there is an abscess formation around the necrotic bone and it is drained either spontaneously or by incision and drainage, forming a sinus, the periosteum builds new bone around the infected bone. At the same time, the necrotic bone is separated from the sur-

From the Department of Maxillofacial Surgery, Chicago College of Dental Surgery, Loyola University; Cook County Hospital, Chicago, and St. Francis Hospital, Evanston, Ill.

rounding bone by resorption of bone at the junction of the necrotic with the living bone by the osteoclasts. The new bone is known as the involucrum and the necrotic bone, when it is completely separated, is known as the sequestrum.

All the time this process of new bone formation and separation of living bone from necrotic bone is going on, the battle between the invading organism and the host continues. The defense is pouring tissue fluids and leukocytes into the abscess area which drain out through the sinus opening. Some of the bone salts are dissolved out of the necrotic area by the absorptive action of the pus and tissue fluids. However, in extensive lesions where there is a large area of necrosis, the sequestrum eventually breaks loose. This can be removed through the draining sinus or surgically.

After the sequestrum is removed, the walls of the cavity do not collapse, as they are bone and form an ideal culture tube. It contains bacteria and tissue fluids. The temperature is ideal; therefore, suppuration continues and, as healing takes place, the cavity is gradually filled in by granulation tissue, which is a slow process with many recurrences of small sequestrations. Eventually the cavity is filled in with connective tissue which is calcified and the continuity of the mandible is restored. This process may take years to be completed. Many of the normal reparative processes can be speeded up by surgical intervention. The course of osteomyelitis of the mandible can be shortened in two ways:

1. The necrotic tissues can be removed with the surrounding normal overhanging bone, creating a cavity or saucerization which the soft tissue can be pressed into to eliminate the defect.

2. Where the entire thickness of the mandible is involved or where sufficient bone is removed to produce deformity, the necrotic bone and granulation tissue can be removed and a metal plate applied to maintain the position of the bone fragments. Then the defect can be filled with pieces of cancellous bone removed from the ilium.

■ *Case 1*

A well developed, well nourished white man, aged 54, was admitted to the hospital with a condition diagnosed as osteomyelitis of the mandible. On August 11, 1947, the patient had odontalgia in the left mandibular region. Swelling developed the following day. He had continuous swelling and pain in the left side of the face until August 25, when a dentist incised and drained the abscess intraorally. The pain and swelling continued. The patient was treated by hot mouthwashes and hot packs. On August 27 he was referred to an oral surgeon who took roentgenograms of the jaw.

On September 6 extraoral incision and drainage were done at another hospital. Several times he was given medicine and told to use hot packs at home. On September 15, he was sent to the Cook County Hospital for treatment of osteomyelitis of the mandible.

PHYSICAL EXAMINATION—Examination was negative with the exception of swelling on the left side of the face over the mandibular region. An extraoral incision was present, and a drain was in the

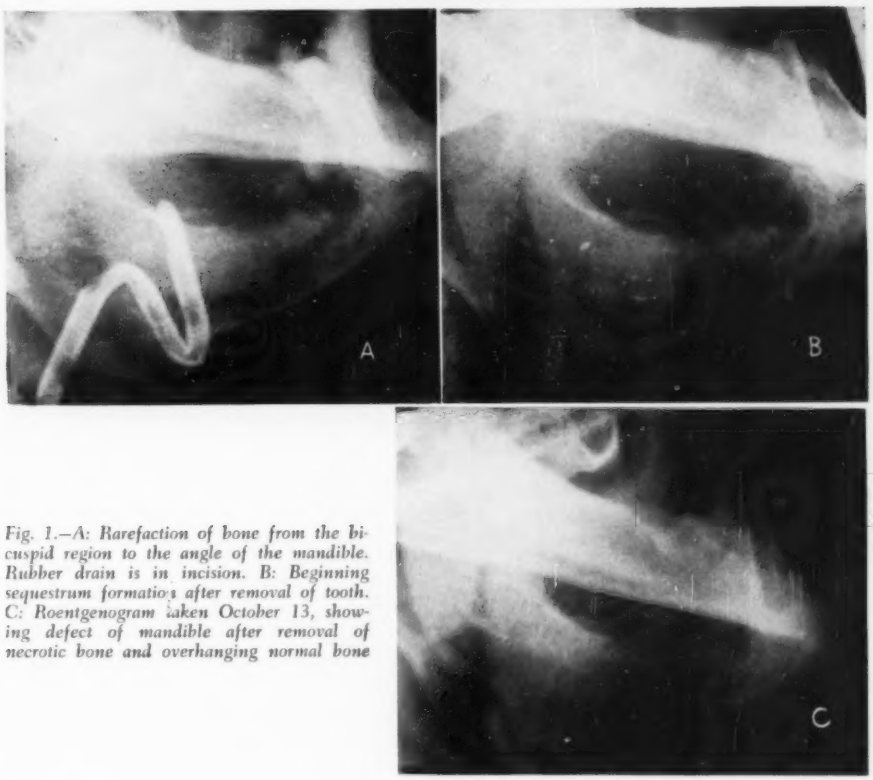


Fig. 1.—A: Rarefaction of bone from the bicuspid region to the angle of the mandible. Rubber drain is in incision. B: Beginning sequestrum formation after removal of tooth. C: Roentgenogram taken October 13, showing defect of mandible after removal of necrotic bone and overhanging normal bone

wound. There was a moderate amount of drainage. The patient's temperature was 101 F., the pulse rate 92 and the respiration rate 20. The teeth in the mandible were in poor condition and periodontal infection was present.

ROENTGEN EXAMINATION—On September 15, diffuse osteomyelitis, extending from the left cuspid to the angle of the mandible, was observed in a roentgenogram (Fig. 1, *A*).

LABORATORY REPORTS—The blood examination on September 18 showed hemoglobin 100 per cent. The white cell count was 7,350 with 71 per cent polymorphonuclear neutrophils, 19 per cent lymphocytes and 8 per cent monocytes. The Kahn test was negative; urinalysis was normal.

TREATMENT — Penicillin (20,000 units) every three hours, and hot wet packs to the left side of the neck every four hours were started September 15.

The patient's temperature was 99.4 F. on September 16 and remained at that level through September 18. On September 19, under local anesthesia, the left mandibular incisors, cuspid and first bicuspid were extracted. On September 21 the patient's temperature was 98.6 F., pulse rate 100 and respiration rate 20. Under local anesthesia the right mandibular second bicuspid and third molar were extracted on September 22, and on September 24, again with local anesthesia, the right mandibular incisors, cuspid and first bicuspid were extracted.

On September 30 sequestrum formation with destruction of the bone was observed (Fig. 1, *B*).

OPERATION—On October 2, 1947, under local anesthesia, induced by extraoral block of the left third division and infiltration of the cervical nerve, an incision was made along the lower border of the left mandible through the periosteum. The soft tissue and periosteum were reflected upward, exposing the buccal surface of the mandible from the mental region to the angle. There were several openings in the cortex through which pus was draining. Involucrum was forming in the areas of sequestration. The buccal cortical plate was removed with osteotomes and rongeurs, revealing a necrotic area of bone and granulation tissue in the medullary portion of the mandible. There was a perforation through which pus had been draining at the lower border of the mandible in the second molar region. All necrotic bone and granulation tissue were removed, exposing the mandibular nerve and vessels from the angle to the mental foramen. The overhanging normal bone was removed which created a space that could be filled by soft tissue. The lingual cortical plate was all that remained of the mandible. The wound was powdered lightly with sulfanilamide crystals, and a small rubber drain was placed in the wound and the wound closed in layers. A pressure dressing was applied to press the soft tissue into the mandibular defect.

A bacteriologic examination taken October 2 revealed hemolytic *Staphylococcus aureus*.

POSTOPERATIVE MANAGEMENT—Penicillin (20,000 units) every three hours was continued postoperatively for ten days. The dressing and drain were removed on the third postoperative day. The remaining sutures were removed on the fifth postoperative day, at which time the wound was healed. Figure 1, *C* shows a roentgenogram taken October 13.

The patient was discharged October 17, returned to work and has had no further swelling or pain.

■ *Case 2*

On January 19, 1948, a well developed, well nourished man, aged 48, came to the Oral Surgery Clinic with the complaints of pain and swelling in the right mandibular region.

The patient gave a history of severe odontalgia. Five weeks earlier, he visited a dentist who removed the lower right first molar. Severe pain followed the extraction. He visited a physician who took roentgenograms of the mandible and prescribed medicine. After about a week of treating him, the physician referred the patient to the Cook County Hospital.

EXAMINATION—The results of the physical examination were negative, except for pronounced swelling of the right side of the face, in the submaxillary and submental regions. There was intraoral drainage from the right molar region. The patient was not acutely ill.

The roentgenographic examination showed bone destruction extending from the symphysis to the right second molar region (Fig. 2, *A*). A diagnosis of osteomyelitis was made.

LABORATORY REPORTS—Blood examination revealed hemoglobin was 112 per cent. The white cell count was 7,350. The Kahn test was negative; urinalysis was normal.

TREATMENT—The patient was hospitalized January 19, 1948, and was given 60 grains sulfadiazine with 60 grains sodium bicarbonate immediately, followed by 15 grains sulfadiazine with 15 grains sodium bicarbonate every four

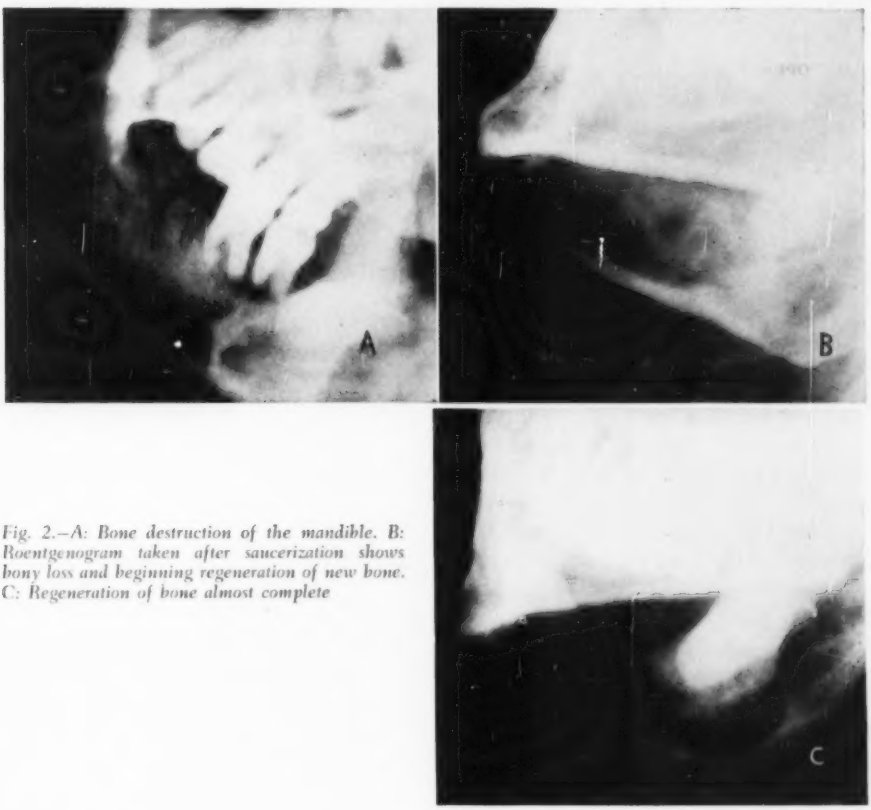


Fig. 2.—A: Bone destruction of the mandible. B: Roentgenogram taken after saucerization shows bony loss and beginning regeneration of new bone. C: Regeneration of bone almost complete

hours. Hot wet dressings were applied to the right side of the face.

On January 20, 30,000 units of penicillin were given every three hours with 100 mg. of ascorbic acid administered twice daily. By January 22, the temperature was 98.2 F. The sulfadiazine was discontinued January 23. The hot wet dressings and the penicillin therapy were continued.

There was a moderate amount of yellowish pus draining from the right first molar socket. On February 7, Ivy loops were placed for immobilization of the jaws after operation.

OPERATION—On February 12, with intravenous thiopental sodium and endotracheal nitrous oxide-oxygen anesthesia, an incision five inches long was made below the lower border of the mandible, extending from the left first bicuspid region to the right angle of the mandible. The incision was made through the skin and deep tissues to the lower border of the mandible and through the periosteum. The periosteum and overlying tissue were elevated upward exposing the buccal surface of the mandible; this brought into view a necrotic region extending from the right second molar area to the left cuspid area. The necrotic bone had started to separate; its attachment to the normal bone was removed with an osteotome. Removal of the entire buccal plate in the involved area exposed a cavity filled with granulation tissue and necrotic bone. The granulation tissue and bone were removed exposing the mandibular nerve from the mental region distally to the second molar region. Necrotic bone at the lower border of the mandible, in the mental region and at the angle, was removed. Overhanging bone of the buccal plate was removed; this left a defect from the right angle to the left cuspid region and from the lower border to the alveolar ridge. The lingual plate was intact except in two areas: the right molar region; the right cuspid region, where the bone was removed, leaving the periosteum intact. In the right first molar region, at the alveolar crest, there was an opening through the mucosa into the oral cavity, which had been draining preoperatively.

The wound was powdered lightly with sulfanilamide crystals, and a Penrose drain was passed along the whole length of the wound, extending through the skin at the distal aspect. The soft tissue was closed in layers by suture of the periosteum and deep tissue with 000 catgut. The skin was closed with black silk, and a pressure dressing was applied to press the soft tissue into the operative defect.

POSTOPERATIVE MANAGEMENT—Penicillin (30,000 units) every three hours was continued. The jaws were immobilized with intermaxillary wires five days later. On February 18, the wound was healing well; the sutures and drain were removed. A roentgenogram taken February 23 showed the involved portion of the mandible (Fig. 2, *B*).

The postoperative course was uneventful. The penicillin was discontinued on March 4. The wound was well healed and the patient was discharged on March 6.

There has been no further recurrence of swelling or drainage and the patient is working every day. A roentgenogram

taken May 17 showed regeneration of bone (Fig. 2, C).

■ *Case 3*

A well developed, well nourished Negro woman, 36 years old, came to the Oral Surgery Clinic, Cook County Hospital, on June 9, 1947. She complained of pain, swelling in the right side of the face, a sore throat and inability to eat. She stated that she had been hit in the face two days previously. (This patient was a chronic alcoholic and was uncooperative throughout her treatment.) Roentgenograms were taken. She was instructed to use hot wet dressings to the side of the face and to return to the clinic the following day for wiring of the teeth, but she did not return until seven days later.

Examination on June 16 revealed a hard firm swelling in the right submaxillary and parotid region of the face. On manipulation of the mandible, crepitation could be elicited in the right mandibular third molar region.

TREATMENT—She was given 45 grains sulfadiazine with 45 grains sodium bicarbonate immediately, and thereafter 15 grains sulfadiazine with 15 grains sodium bicarbonate every four hours.

On June 18, under local anesthesia, extraoral incision and drainage of the large swollen area in the right submaxillary region was performed. A Penrose drain was inserted into the abscessed cavity.

Roentgenograms taken July 16 revealed a fracture of the right mandible at the angle. The cancellous structure of the mandible anterior to the fracture was somewhat radiolucent, with loss of calcium detail. There was a small radiolucent area just posterior to the fracture line (Fig. 3, *A* and *B*).

On July 24, with local anesthesia, the right third molar in the line of fracture was removed. This patient was admitted to the hospital on July 28 with a diagnosis of osteomyelitis of the right mandible.

PHYSICAL EXAMINATION—Examination revealed the patient to be well developed, well nourished, not acutely ill but obviously intoxicated. There was a swelling of the right submaxillary and parotid regions, enlarged submaxillary and cervical glands of the neck and fracture of the mandible in the right third molar area.

OPERATION—On July 31, with intratracheal ether anesthesia, an incision four inches long was made parallel to and one inch below the anterior crest of the right ilium. The incision was made through the skin and subcutaneous tissue. The upper edge of the wound was elevated over the anterior crest of the ilium, an incision was made through the fascia and periosteum along the center of the anterior crest and the periosteum elevated from the inner aspect of the crest and pelvic area down two inches. With periosteotome and mallet, a piece of bone measuring 3 by 2 by ⅜ inches was removed, the outer crest and the cortical plate being left intact. The deep tissues were closed with 000 catgut; continuous silk sutures were used for the skin. An incision four inches long was made parallel to and just below the lower border of the right side of the mandible,

down through the periosteum. The periosteum and soft tissues were elevated over the buccal surface of the mandible exposing the fracture. All necrotic bone and granulation tissue were removed; leaving a mandibular defect about one and a half inches long.

A Lane plate was placed across the defect and attached to the proximal and distal fragments by one screw in each

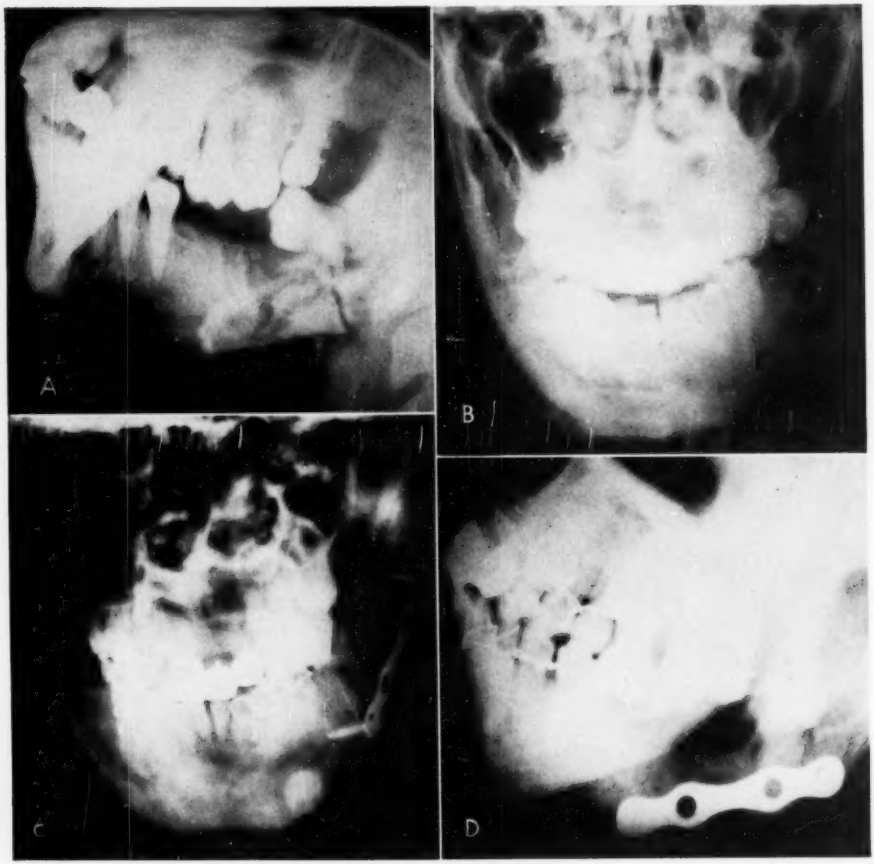


Fig. 3.—A: Fracture line in right third molar region, with bone involvement of both fragments and third molar. B: Roentgenogram showing bone involvement of both fragments. C: Bone graft and plate in position, and beginning calcification at the fractured ends. D: Plate in position and almost normal density of bone

end. The cortical bone was removed from the graft and the spongy medullary bone was shaped to fit the defect. It was made a little oversized and pressed into position. The wound was powdered lightly with sulfanilamide crystals and a rubber drain was inserted. The wound was closed in layers with 000 catgut for the deep layers; interrupted silk skin sutures were used for skin closure. A pressure dressing was applied.

POSTOPERATIVE MANAGEMENT—Penicillin (20,000 units) was given every three hours. Hot wet dressings were applied every four hours from August 6 through August 9.

On August 5, intermaxillary wiring and Ivy loops were placed to immobilize the mandible. The sutures and drain were removed August 7. The wound was still draining a small amount. The wound was dry and well healed by August 9, when the patient was discharged to the outpatient clinic for observation. When she returned on August 18 there was some suppuration from one area of the incision. The intermaxillary wires had been removed by the patient, "so she could eat." (She had been drinking heavily.) The wires were reapplied, but each time the patient returned they had been removed.

In spite of her lack of cooperation, the wound finally stopped draining, and the mandible was firm, without drainage, on October 27.

A roentgenogram taken August 21 showed the cancellous bone graft in position with beginning calcification at the fracture ends (Fig. 3, *C*). A roentgenogram taken April 23, 1948, showed the bone had filled in to almost normal density (Fig. 3, *D*). There had been no recurrence when last heard from, in August 1948.

■ *Case 4*

A well developed, well nourished white man, aged 51, complained of pain and swelling under the chin.

On May 7, 1948, this patient had fallen while going up a flight of stairs, and, although there had been some bleeding in the mouth at the time, he did not think he was seriously injured. Pain and swelling under the chin started four days later. The patient was sent to a hospital where roentgenograms were taken. These revealed a fracture of the mandible and the patient was referred to the Cook County Hospital May 14 for further treatment.

TREATMENT—On May 15, the patient was admitted to the outpatient clinic of the Oral Surgery Department, where arch bars were applied and the jaw immobilized. Roentgenograms showed a fracture of the mandible on the right, near the symphysis. Detail was not good; however, there was a suggestion of an impacted tooth between the fracture fragments (Fig. 4, *A*).

The patient's condition was good until May 26 when he complained of pain and swelling in the submental region. When roentgenograms were checked, they were found to reveal a slight displacement of fragments, and the possible presence of an unerupted right cuspid in the line of fracture (Fig. 4, *B*). There was drainage from the torn tissue in the right cuspid area.

The patient was admitted to the hos-

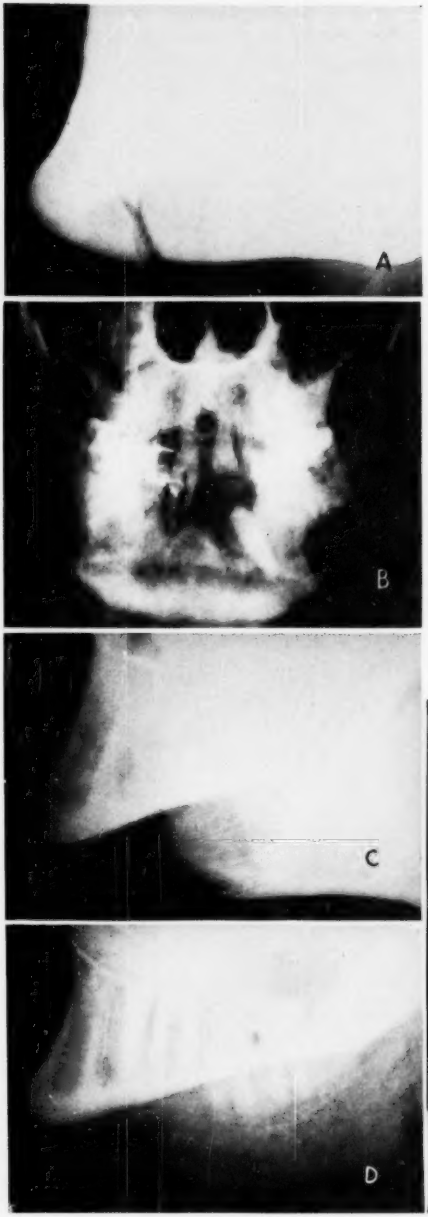


Fig. 4.—A: Fracture of mandible with fragments in satisfactory position

B: Posteroanterior view showing unerupted cuspid in line of fracture

C: Sh wing bone destruction of lower border of mandible

D: Bone graft in place; calcification is beginning

E: Pressure dressing in place. Dressing consists of fine mesh gauze, dry or with petrolatum, over the wound. A large amount of fluff gauze is placed over the area, and behind the ears. The head is bandaged with stockinette, applied snugly. This gives pressure to the wound and holds the soft tissues in the defect

pital on May 27 with acute cellulitis of the mental region and drainage from the right cuspid region into the mouth. It was believed that the unerupted tooth was contributing to the infection and should be removed.

The patient was given penicillin (30,000 units) every three hours, 150 mg. ascorbic acid and brewers yeast tablets twice daily; sedatives were given for pain as needed. On May 29, 60 grains sulfadiazine with 60 grains sodium bicarbonate were given; the initial dose was followed by 15 grains sulfadiazine with 15 grains bicarbonate every four hours. By June 1 the swelling in the submental region was greatly reduced. The temperature was normal.

On June 3, using local anesthesia, the unerupted lower right cuspid was removed. It was lying in a bed of loose fragments of necrotic bone and granulation tissue. The cavity was cleaned out and the jaw rewired.

By June 5, the swelling had subsided. There was no suppuration present. The patient was comfortable and the fracture fragments were in good alignment. The penicillin, ascorbic acid and brewers yeast were discontinued and the patient was discharged. On June 15, the patient returned to the clinic with a large fluctuant swelling in the submental region and complained of severe pain. Under local anesthesia an extraoral incision was made and the abscess drained. A roentgenogram taken June 15 showed destruction of the lower border of the mandible in the region of the fracture (Fig. 4, C). The patient was readmitted to the hospital June 23.

The dressing was changed, and purulent discharge was found to be present. The drain had become dislodged from the extraoral incision. The patient's temperature was 99.4 F. on admittance. Penicillin therapy was instituted and by June 26 the purulent discharge was diminishing and the edema subsiding. On June 27, the penicillin dose was increased. The suppuration was minimal.

OPERATION—On July 1, 1948, under bilateral extraoral mental block and infiltration anesthesia, a three and a half inch incision was made over the lower border of the mandible. The incision extended through the skin, superficial fascia, deep fascia and periosteum. The periosteum and soft tissue were reflected upward, exposing the fracture site and a necrotic area of bone 2.5 by 1.5 cm. The sequestrating bone and the surrounding necrotic bone and granulation tissue were removed, leaving a defect of the mandible extending from the right first bicuspid to the left lateral incisor. There was separation of the fragments of the fracture in this area, but bone in the alveolar process remained in contact.

This defect was then reconstructed with cancellous bone from the iliac crest of another patient. The lower border was formed by a piece of medullary bone, 1 by 1.5 by 2.5 cm., and the remainder of the defect was filled with small chips of cancellous bone. The wound was sprinkled lightly with sulfanilamide crystals and a tube drain inserted. The wound was closed in layers: periosteum and muscles with interrupted 000 catgut, the skin with interrupted subcuticular 0000 catgut and the skin proper with black silk. A pressure dressing of stockinette was applied.

POSTOPERATIVE MANAGEMENT—The patient was fairly comfortable the first postoperative day. There was moderate swelling of the wound. Penicillin (40,000 units) every three hours was continued. Removal of the pressure dressing on July 3 showed considerable sanguineous discharge. The wound was irrigated with 100,000 units of penicillin. The tube drain was removed from the wound. There was considerable inflammation present. A pressure dressing was applied. Intermaxillary elastics were replaced July 6. The pressure dressing was changed July 8 and the remaining skin sutures were removed.

The wound was healing well except for a small opening at the site of the drain. There was a slight sanguineous discharge. The inflammation had subsided considerably. The wound continued to heal well, and by July 12 was completely closed, although a slight inflammatory reaction persisted. There was no drainage present. The temperature remained normal; the wound was completely healed, no drainage or inflammation was present by July 25.

A roentgenogram taken July 23 showed the bone graft in good position (Fig. 4, *D*). Penicillin therapy was discontinued July 26, the day of the patient's discharge. He was observed by the outpatient clinic of the Oral Surgery Department. The patient has had no further trouble.

■ *Comments*

These four cases were selected as representative of more than 100 cases of osteomyelitis of the mandible I have treated in the last four years. No attempt was made to isolate the causative organism as most of the patients had been treated by sulfonamides or penicillin before being seen in this office.

There is no doubt that early use of sulfonamides and penicillin reduces the incidence of osteomyelitis; or after it has developed, prevents its extension. However, once the bone has become necrotic, the dead bone must be removed and replaced by living tissue. In the treatment by incision and drainage, where the sequestrum is allowed to form, and is removed either by resorption, through sinus by incision, a cavity remains where wound secretions collect, acting as a good culture medium which invites infection and delays healing.

The surgical removal of the necrotic and overhanging bone permits the cavity to be filled in by soft tissue by means of pressure applied by the pressure dressing (Fig. 4, *E*), thus preventing the collection of fluid in a dead space. Where there is a full thickness loss of the mandible, the area is restored by planting living cancellous bone to maintain this space. The graft stimulates new bone formation in spite of the fact that the bone is placed in an infected cavity. Cancellous bone can be placed in infected cavities of the mandible if all the necrotic bone and infected granulation tissue have been removed. Good circulation plus the administration of enough penicillin and sulfonamides to maintain a blood level sufficient to prevent the growth of bacteria that remain in the surrounding tissue permits healing to take place without infection. The elimination of any cavity or space to allow collection of tissue, fluid or blood by a firm pressure dressing, permits healing to take place without recurrence of infection.

■ *Conclusion*

Four cases of osteomyelitis are reported. Cases 1 and 2 were treated by removal of the involved and overhanging bone, suturing the wound with drainage and applying a pressure dressing to push the soft tissue into the defect to prevent the collection of wound secretion.

In case 3 the involved bone was removed, leaving a full thickness defect of the mandible. This was treated by applying a metal plate to maintain the position of the fragments, and filling the defect with cancellous bone removed from the patient's ilium. Then the wound was closed with drainage and a pressure dressing applied.

Case 4 was treated by removal of the involved bone and filling in the defect with cancellous bone removed from the ilium of another patient. The wound was closed with drainage and a pressure dressing was applied.

By combining the use of surgery, sulfonamides and antibiotics the course of osteomyelitis of the mandible can be shortened.

Immobilization is important. A good pressure dressing not only prevents the collection of fluid in the wound but it also immobilizes the mandible. The pressure should be maintained for at least ten days. It would be much better to immobilize the jaws with intermaxillary wires immediately after the operation, but this is not always possible.

In the early cases sulfonilamide was powdered lightly in the wounds and all cases were drained but they are not always necessary. It is safer to place a drain and remove it after the first dressing in 48 hours.

Dr. Stuteville presents an entirely new concept of the management of osteomyelitis of the mandible. His theories are based on the treatment of a large series of cases at Cook County Hospital. Although the treatment that he recommends is not in keeping with the generally accepted principles of the management of this type of case, it is presented here so that the readers of the JOURNAL OF ORAL SURGERY *will have the benefit of his experience on this controversial subject.—Editor.*

■ PARA-CHLOROPHENOL

Para-chlorophenol finds its greatest use in dentistry in the treatment of root canal and periapical infections. For this purpose it is usually prepared in the proportion of three parts of para-chlorophenol crystals to seven parts of gum camphor. In this form it is not caustic and will not injure the soft tissues.—*Accepted Dental Remedies, ed. 15, p. 16.*

The value of gingival biopsy in the diagnosis of generalized amyloidosis

■ *Irving Meyer, D.M.D., M.Sc., Springfield, Mass.*

Generalized amyloidosis is usually seen as a complication of a chronic suppurative disease such as tuberculosis, osteomyelitis, suppurative arthritis and syphilis.[1-4] Amyloidosis (or amyloid disease) has been reported to have been present in 7.2 per cent of 1,727 necropsies performed at a general chronic disease hospital,[3] and to have been noted in 40 per cent of all patients with chronic pulmonary tuberculosis.[2] The disease is important clinically because it complicates the course of treatment of the underlying disease, and amyloidosis, *per se*, can be a direct cause of death.[5]

Clinical diagnostic procedures and laboratory tests, including the Congo red absorption test, have often failed to substantiate a definite diagnosis of the disease. Recently it has been suggested that gingival biopsies are useful as an aid in the establishment of the diagnosis.[6] It is the purpose of this paper to present further evidence as to the value of this procedure where the diagnosis of generalized amyloidosis is suspected.

■ *A Review of Amyloid Disease*

GENERAL AND CLINICAL ASPECTS—Amyloid disease is a degenerative replacement process in which an abnormal protein forms as a result of a general metabolic disturbance and is deposited in tissues. This deposition may interfere with the normal function of the involved organ or organs. It does not affect the parenchymatous elements primarily but rather appears to be a disruption of the connective tissue elements. It is seen characteristically beneath the endothelial lining of capillaries and in the media of arterioles. An organ infiltrated with amyloid appears grossly to be enlarged, firmer than normal, waxy, tan or yellowish brown in color and slippery or greasy to touch.[1, 2, 3, 7]

Clinically, amyloid disease may be divided into four groups:[2] (1) secondary amyloidosis; (2) primary amyloidosis, such as is seen localized in the tongue, heart, alimentary tract and muscular system;[8, 9, 10] (3) amyloidosis associated with

A thesis submitted to the Graduate School of Medicine, University of Pennsylvania, toward the requirements for the degree of Master of Medical Science in Dentistry.

Resident in Oral Surgery, Philadelphia General Hospital, and Department of Public Health, Philadelphia.

1. Boyd, W., *A Textbook of Pathology*, ed. 4. Philadelphia: Lea & Febiger, 1943, pp. 30-35.

2. Moore, R. A., *A Textbook of Pathology*. Philadelphia and London: W. B. Saunders Company, 1944, pp. 15-18.

3. Jacobi, M., and Grayzel, H., Generalized Secondary Amyloidosis. A Clinico-Pathological Study of 84 Cases. *J. Mt. Sinai Hosp.* 12:339 (May-June) 1945.

4. Cohen, S., Amyloidosis Complicating Tuberculosis—Diagnosis, Prognosis, and Treatment. *Ann. Int. Med.* 19:990 (Dec.) 1943.

5. Pearlman, A. W., Amyloidosis: A Clinical and Pathological Study of 135 Cases. *Quart. Bull., Sea View Hosp.* 6:295 (April) 1941.

6. Selikoff, I. J., and Robitzek, E. H., Gingival Biopsy for the Diagnosis of Generalized Amyloidosis. *Am. J. Path.* 23:1099 (Nov.) 1947.

7. Grayzel, H. G., and others, Amyloidosis—Experimental Studies. *Arch. Path.* 17:50 (Jan.) 1934.

8. Budd, J. W., Primary Amyloid Disease of the Heart. *Am. J. Path.* 10:299 (March) 1934.

9. Warren, S., Generalized Amyloidosis of the Muscular Systems. *Am. J. Path.* 6:161 (March) 1930.

10. Golden, A., Primary Systemic Amyloidosis of the Alimentary Tract. *Arch. Int. Med.* 75:413 (June) 1945.

multiple myeloma;[11,12] (4) tumor-forming amyloidosis.

Secondary amyloidosis is the most common form of the disease. The use of antibiotics, sulfonamides and prompt radical surgery against foci of suppuration has reduced greatly the number of potential sources of amyloidosis. Tuberculosis is at present the most frequent underlying disease.[1,2] In a controlled series of observations, it was noted that amyloidosis is most frequently associated with empyema and with the suppurative complications of tuberculosis of the bone and genitourinary tract.

The organs most commonly affected with amyloidosis are the liver, spleen and kidney, while the adrenal glands, pancreas, intestines and mucous membranes are involved to a lesser extent.[5] Amyloidosis of the adrenal glands occurred in 50 per cent of 135 cases of generalized amyloidosis, and it is often associated with the development of an Addisonian syndrome.[5,13,14] The liver, spleen and kidneys may enlarge so as to be palpable clinically and when the disease causes symptoms, the symptomatology is due to secondary destruction of the parenchymatous tissues of these organs by the amyloid substance.[5,15,16] Liver involvement is evidenced by the onset of hypercholesteremia (which sharply declines *in terminus*), alteration of total serum proteins, inversion of the ratio of albumin to globulin, proteinuria and generalized edema. The total serum protein is normal or slightly elevated at first, but the serum globulin gradually increases while being accompanied by a decrease in albumin. Diminution of the total serum protein continues while a concomitant inversion of the albumin globulin ratio is evidenced.[3,5,17,18]

Secondary amyloidosis is found more frequently in males, and Rosenblatt[19] reports its highest incidence to be in the fourth decade. It has been variously reported to occur within one to five years after the onset of the primary disease. In one series of 110 cases of tuberculosis associated with amyloid disease one-fifth were aware of their tuberculosis less than two years.

CHEMICAL NATURE—The chemical nature of amyloid is problematical. Virchow ascribed the name "amyloid" to this homogeneous substance because he erroneously considered it to be a carbohydrate similar to starch.[12] Krakow (1897) believed it to be a combination of protein (albumin) and chondroitin-sulfuric acid: Hanisen (1908), however, was unable to substantiate this theory. Mayeda (1909) found no evidence of sulfuric acid and Eppinger (1921) analyzed a tumor mass of amyloid without finding any sulfur.[14,18] Hass and others succeeded in isolating relatively pure proteins of amyloid by extractions at different hydrogen ion concentrations.[2] Since amyloid is not a normal constituent of the body, it is possible

11. Magnus-Levy, A., Bence-Jones-Eiweiss und Amyloid. *Ztschr. f. klin. Med.* **116**:510, 1931.

12. Bell, E. T., Renal Lesions Associated With Multiple Myeloma. *Am. J. Path.* 9:393 (July) 1933.

13. McCutcheon, M., The Relation of Addison's Disease to Amyloidosis. *Am. J. M. Sc.* **166**:197 (Aug.) 1923.

14. Snapper, I., and Chin, K. Y., Massive Amyloidosis of Both Adrenal Cortices; Clinical Syndrome With Pathological Findings. *Chinese M. J.* 57:201 (March) 1940.

15. Bell, E. T., Amyloid Disease of the Kidneys. *Am. J. Path.* 9:185 (March) 1933.

16. Moschcowitz, E., The Clinical Aspects of Amyloidosis. *Ann. Int. Med.* **10**:73 (July) 1936.

17. Rosenblatt, M. B., Clinical Manifestations of Amyloidosis. *Ann. Int. Med.* **8**:678 (Dec.) 1934.

18. Linder, G. C., and others, A Clinical, Pathological and Biochemical Study of Amyloid Nephrosis. *Arch. Dis. Childhood* 2:220 (Aug.) 1927.

that its chemical composition varies somewhat with its source. The substance is insoluble in water, soluble in strong alkalies, slightly soluble in strong acid and unaffected by peptic digestion.[1]

EXPERIMENTAL WORK—Amyloid can be produced experimentally in animals. Kuczynski (1922) produced amyloid in mice by injecting sodium caseinate, and if the disease was not too far advanced, the amyloid was resorbed after cessation of the injections.[20] Morgenstern (1926) substantiated this work, and further found connective tissue repair in the liver during recovery.[21] By restricting water intake and using various proteins such as sodium caseinate, gelatin, egg albumens, cereal albumin, nuclein and peptone, Letterer (1926) succeeded in causing amyloidosis more quickly.[22] Finally, Smetana developed a technic to produce amyloid in mice with seventeen daily injections of nutrose.[1] By intravenous injections of living and/or dead bacteria in mice, Dogmagk produced amyloidosis. Jaffe (1926) concluded from Dogmagk's work, as well as his own, that amyloidosis resulted from an acquired hypersensitivity to a foreign protein; that is, amyloid formed as an allergic response to foreign protein.[23] In 1934 Grayzel and others found that amyloid appeared earliest in the fixed and wandering cells of the reticulo-endothelial system, and as these cells degenerated, extracellular amyloid appeared and increased until eventually the parenchyma of the organ was secondarily obliterated.[7] Reimann and Eklund (1935), quoting Paltauf (1899) and Sipes (1930) all of whom found amyloidosis in horses receiving repeated antigens for production of serum and vaccines, attribute the development of the disease in a patient who had received 41 vaccine injections over 22 months to the same phenomenon.[24]

ETIOLOGY—Jacobi and Grayzel[3] summarized the theories of the etiology of amyloidosis as follows:

1. Jaffe—an allergic response to foreign proteins.
2. Kuczynski—a disorder of endogenous metabolism exclusively.
3. Eklund and Reimann—a result of hyperproteinemia (hyperglobulinemia).
4. Smetana—a disturbance of the reticulo-endothelial system.
5. Jacobi and Grayzel—a disorder of endogenous protein metabolism with involvement of the reticulo-endothelial system.

The latter concept actually is a combination of several of the earlier theories. Jacobi and Grayzel[3] believe that a chronic suppurative or cachectic disease, or "catabolic exciting agent" will predispose to excessive tissue protein destruction.

The disintegrated endogenous protein fractions cannot be readily metabolized or excreted by the body and the reticulo-endothelial system is called upon to phagocytize these substances. At first it attempts to meet the situation by

19. Rosenblatt, M. B., Amyloidosis and Amyloid Nephrosis. *Am. J. M. Sc.* **186**:558 (Oct.) 1933.

20. Kuczynski, M. H., Edwin Goldmann's Untersuchungen uber cellulara Vorgange in grund nachgelassener Praparate dargestellt und durch neue Versucherganzt. *Virchows Arch. f. path. Anat.* **239**:185, 1922.

21. Morgenstern, Z., Zur Frage uber amyloidosis und resorption. *Virchows Arch. f. path. Anat.* **259**:698, 1926.

22. Letterer, E., Studien uker Art und. Entstehung des Amyloids. *Beitr. Z. path. Anat. u.z. allg. Path.* **75**:486, 1926.

23. Jaffe, R. H., Amyloidosis Produced by Injections of Proteins. *Arch. Path. & Lab. Med.* 1:25 (Jan) 1926.

24. Reimann, H. A., and Eklund, C. M., Long-Continued Vaccine Therapy as a Cause of Amyloidosis. *Am. J. M. Sc.* **190**:88 (July) 1935.

hypertrophy and hyperplasia. If the process of destruction continues, the reticulo-endothelial system decompensates, permitting increasing deposition of amyloid in the organs. Whether hyperproteinemia or hyperglobulinemia is a manifestation of this disorder and is due to a general accumulation or merely represents the transportation of protein material from the source of orgin to the endothelial system, is at present difficult to say.

As yet there is no concrete evidence showing globulin to be the mother substance of amyloid.

DIAGNOSIS—The diagnosis of generalized amyloidosis is often a difficult problem. Formerly, the classical triad for diagnosis was (1) chronic suppuration; (2) hepatosplenomegaly; (3) albuminuria. As Altnow pointed out, however, if this triad had been strictly followed as the criteria for diagnosis there would have been a diagnostic error of 75 per cent in a 16 case series of renal amyloidosis.[25] The introduction of the Bennhold Congo red test (1923) has proved invaluable as a diagnostic aid, but this test is not without limitation and hazards. Congo red is a colloidal dye which has an affinity for amyloid. The technic devised by Bennhold is as follows: 10 cc. of a 1 per cent aqueous solution of Congo red is injected intravenously. Blood specimens are taken after 4 minutes and after 60 minutes. The difference between the two specimens indicates the amount of dye absorbed from the blood stream by the amyloid. Bennhold considered 40 to 100 per cent absorption to be diagnostic of amyloidosis.[26] Other workers soon found that a 40 per cent absorption did not indicate accurately the presence of the disease: moreover, patients with 80 to 90 per cent absorption often do not have amyloidosis. Although patients with 90 to 100 per cent retention levels have occasionally been shown not to have amyloidosis, such levels are generally accepted as diagnostic of the disease. Some workers consider only 100 per cent as diagnostic, but clinical studies show that the "false positives" that might occur in 90 to 100 per cent can be eliminated by two consecutive Congo red tests.[27-34]

Congo red has been reported as not being as innocuous as formerly believed.[35-38] Taliaferro and Haag (1937) noted a decrease in coagulation time following its use.[37] Selikoff and Bernstein (1946) reported six cases of severe systemic reactions, two fatal, following routine administration of the dye. Whether this was related to the thromboplastic ef-

25. Altnow, H. O., and others, Renal Amyloidosis. Clinical Course and Pathologic Lesions in Sixteen Cases. *Arch. Int. Med.* 56:944 (Nov.) 1935.

26. Bennhold, H., Uber die Ausschiedung intravenes einverleibten Kongorotes bei den verschiedensten Erkrankungen insbesondere bei Amyloidosis. *Deutsches Arch. f. klin. Med.* 142:32 (March) 1923.

27. Selikoff, I. J., Diagnosis of Generalized Amyloidosis by the Congo Red Test: Definitive Diagnostic Criteria. *Am. J. M. Sc.* 213:719 (June) 1947.

28. Selikoff, I. J., The Significance and Interpretation of the "Doubtful" Congo Red Test. *Quart. Bull., Sea View Hosp.* 8:194 (July) 1946.

29. Bookman, A., and Rosenthal, J., The Clinical Value of Intravenous Injection of Congo Red in Diagnosis of Amyloid Disease. *Am. J. M. Sc.* 173:396 (March) 1927.

30. Lipstein, S., and Auerbach, O., An Evaluation of the Congo Red Test for Amyloidosis. *Quart. Bull., Sea View Hosp.* 2:120 (Jan.) 1937.

31. Lipstein, S., An Evaluation of the Congo Red Test for Amyloidosis. *Am. J. M. Sc.* 195:205 (Feb.) 1938.

32. Harmon, P. H., and Kernwein, G., Congo Red Test for Amyloid Disease. *Arch. Int. Med.* 70:416 (Sept.) 1942.

33. Harmon, P. H., and Kernwein, G., Utility of the Congo Red Test in Diagnosis and in Differential Diagnosis. *Arch. Int. Med.* 70:421 (Sept.) 1942.

34. Stemmermann, M. G., and Auerbach, O., The Value and Limitations of the Congo Red Test for Amyloidosis. *Am. J. M. Sc.* 208:305 (Sept.) 1944.

35. Richardson, A. P., and Dillon, J. R., Jr., Congo Red: Toxicity and Systemic Actions. *Am. J. M. Sc.* 198:73 (July) 1939.

36. Macht, D. I., and others, Toxicological Studies on Congo Red. *J. Am. Pharm. A.* 28:495 (Aug.) 1939.

37. Taliaferro, L., and Haag, H. B., The Toxicity and Effect of Congo Red Upon Blood Coagulation. *Am. J. M. Sc.* 193:626 (May) 1937.

38. Selikoff, I. J., and Bernstein, I. J., Systemic Reactions to the Intravenous Administration of Congo Red. *Quart. Bull., Sea View Hosp.* 8:131 (April) 1946.

fects of the dye could not be determined. They caution against the widespread assumption that Congo red is always innocuous and further warn against its use in patients with arteriosclerosis who have previously received the dye.[38]

Before the Congo red test was used, amyloidosis was diagnosed by tissue biopsy. Josefson and Waldenstrom (1928) performed biopsies on the liver and spleen: this method has often been used on experimental animals and on primary amyloidosis cases in man.[6, 39] However, liver and spleen biopsies in humans are not without danger, and despite good surgical technic, uncontrolled hemorrhage has occurred following this procedure.[40, 41] Gingival biopsies for the diagnosis of amyloidosis were suggested by Selikoff in 1946 when he reported a high percentage of positives in 21 cases of amyloidosis being studied in a Congo red experiment.[27] Shortly thereafter, Selikoff and Robitzek[6] carried out further investigation of the diagnostic value of gingival biopsies and obtained positive results. Their work has not as yet been substantiated or negated by other workers.

THERAPY AND PROGNOSIS—The prognosis of a patient with generalized amyloidosis is grave. Cohen (1943) in a series of 58 tuberculosis patients with secondary generalized amyloidosis found almost 90 per cent died within two years after the development of amyloidosis.[4] In 135 cases studied by Pearlman (1941) over half died within one year or less. However, except for those patients who developed uremia (30 per cent at most) the cause of death was related to the underlying disease.[5] Rosenblatt states that in amyloidosis of the kidney extensive degeneration may be present for many years without any clinical signs of impairment of renal function.[17] From this and other evidence it may be inferred that the poor prognosis is due to the severity of the basic disease, rather than the amyloidosis itself. The presence of amyloidosis may best be considered as a complication which serves as a poor prognostic sign for the eventual outcome of the patient's primary disease.[4, 5, 17, 42]

Treatment of generalized amyloidosis may be considered from two aspects: (1) eradication of the underlying disease, and (2) treatment for the amyloidosis itself. Auerbach and Stemmermann studied 86 patients, half of whom were subjected to surgical treatment prior to, and half after, the development of generalized amyloidosis.[43] They concluded from their investigation that:

1. Early recognition of amyloidosis was essential.

2. Amyloidosis is no contraindication to major surgery.

3. Temporization with conservative therapy may result in lost opportunity for saving the patient's life.

4. Energetic supportive therapy of damaged viscera must accompany major surgery.

Since evidence for the occurrence of

39. Dantchakow, W., Uber die Eutwicklung und Resorption experimentell erzeugter Amyloidsubstanzinden Speicheldrusen von Kaninche. *Virchows Arch. f. path. Anat.* 187:1, 1907.

40. Linder, M. C. F., and others, Liver Biopsy in the Study of Hepatic Disease. Scientific Exhibit, A.M.A. Atlantic City Session. 1949.

41. Cogswell, R. C., and others, Needle Biopsy of the Liver. *J.A.M.A.* 140:385 (May) 1949.

42. Rosenblatt, M. B., Recovery From Generalized Amyloidosis Secondary to Pulmonary Tuberculosis. Report of a Case. *Arch. Int. Med.* 57:562 (March) 1936.

43. Auerbach, O., and Stemmermann, M. G., Surgery in the Tuberculous Patient With Amyloidosis. *Am. Rev. Tuberc.* 53:333 (April) 1946.

resorption of amyloid is not overly convincing, the ideal treatment must be preventive. Prevention of massive deposition of amyloid with its subsequent visceral damage is best accomplished by eradication of the basic disease.[43,44] Thus, the advisability of surgical intervention may be influenced by this factor, and the presence of amyloid is an added incentive and not a deterrent to surgical procedures which may eradicate the suppurative foci. Historically, the earliest recovery following amputation of a leg with chronic suppurative osteomyelitis was in 1891.[45] Walker[46] (1928) and Reimann[47] (1935) each described recovery from amyloidosis following the obliteration of chronic suppuration by surgical means. Pearlman[48] (1940) cites a case of recovery following surgery and improvement of the tuberculous status of the patient.

Administration of whole liver with supplementary vitamin therapy has been advocated in the treatment of amyloid disease. Whitbeck,[49] Rosenblatt,[42] Grayzel and Jacobi,[50] and Cohen[4] have all used liver therapy with varying degrees of success: again, the control of the underlying disease was usually a factor in those cases showing a regression of amyloid disease. Grayzel and Jacobi, however, report clinical improvement occurring in several cases during the process of active suppuration, the clinical cure preceding the decrudescence and disappearance of the primary disease.[50]

A review and summation of the literature on treatment of amyloidosis by Cohen[4] in 1943 indicates:

1. Moderate amounts of amyloid experimentally induced may recede after removal of the insulting agent.

2. Clinical evidence of amyloid regression in man has been demonstrated after the underlying pathology was controlled, but anatomic proof of regression is as yet not sufficient.

3. Proper diet together with a liberal intake of liver and vitamins may possibly be of some value in selected patients.

■ *Previous Research on Gingival Biopsies*

Selikoff and Robitzek[6] studied 47 patients of whom 18 were considered clinically positive for amyloidosis. Of these 18 patients, gingival biopsy showed amyloid present in 14. In 5 cases of amyloidosis with "negative" Congo red tests, 4 showed amyloid in the gingivae. They found no correlation between the amount of gingival amyloid and that present in the visceral organs. Since they found no amyloid present in the gingiva of some patients with moderate amyloidosis, they concluded that a negative gingival biopsy did not necessarily rule out the disease. They recommended multiple sections be stained. If the biopsy was still negative despite clinical evidence of the presence of amyloidosis, they advised a repeat biopsy from another site.

44. Gairdner, W. T., Recovery in a Case of Amyloidosis. *Trans. Assoc. Amer. Phys.* 6:149, 1891.

45. Habein, H. C., Amyloidosis: Report of a Case in Which the Patient Recovered. *Proc. Staff Meet., Mayo Clin.* 9:261 (May) 1934.

46. Walker, G. F., A Case of Recovery From Amyloid Disease. *Lancet* 2:120 (July) 1928.

47. Reimann, H. A., Recovery From Amyloidosis. *J.A.M.A.* 104:1070 (March) 1935.

48. Pearlman, A. W., Regression of Amyloidosis. *Quart. Bull., Sea View Hosp.* 6:92 (Oct.) 1940.

49. Whitbeck, B. H., Liver Meal in the Treatment of Amyloidosis in Surgical Tuberculosis. *J. Bone & Joint Surg.* 14:85 (Jan.) 1932.

50. Grayzel, H. G., and Jacobi, M., Secondary Amyloidosis: Results of Therapy With Desiccated Whole Liver Powder. *Ann. Int. Med.* 12:39 (July) 1938.

■ *Methods and Materials*

Since Selikoff's and Robitzek's work has as yet not been repeated, or if repeated, not reported in the literature, this study was undertaken at the Metropolitan Hospital during the period from July 1, 1948, to June 30, 1949.

Four hundred and fifty patients with pulmonary and/or osseous tuberculosis were studied with no known cases of amyloidosis present among them. Biopsies were performed at random on 20 patients who were undergoing routine dental extractions. This was considered the control group or Group A. Then all 450 patients were subjected to a thorough screening for the presence of: (1) hepatomegaly or splenomegaly; (2) albuminuria; (3) lowered total serum proteins; (4) inverted albumin to globulin ratio. After this survey was completed, 37 patients were selected as possible cases of amyloid disease. These patients constituted Group B. The following procedures were then carried out on this group and, wherever possible, on Group A.

1. Clinical examination, for the presence of: (*a*) hepatomegly; (*b*) splenomegaly; (*c*) edema.
2. Urinalysis for the presence of albuminuria.
3. Liver function tests for (*a*) blood cholesterol and cholesterol esters; (*b*) serum proteins, including albumin-globulin ratio.
4. Congo red absorption tests.
5. Gingival biopsy.

The Congo red test was the Taran modification of the Bennhold method, accepted as the standard by the Committee on Standard Laboratory Procedures of the American Trudeau Society.[51,52]

Gingival biopsies were taken from the alveolar crest, usually the interdental papilla, and were approximately 3 by 5 mm. in size. Local anesthesia and scalpel were used in each case. The specimen was fixed in 10 per cent Formalin and then embedded in paraffin. Three staining technics were followed: (1) hematoxylin and eosin; (2) Congo red; (3) methyl violet (Krajian's technic).[53] The findings were similar to those of Selikoff and Robitzek in that methyl violet was by far the most satisfactory while the hematoxylin-eosin and Congo red were indifferently successful at best in demonstrating the presence of amyloid in gingival tissue.

Methyl violet stain and diffuse daylight as the source of light with the microscope showed the amyloid as a violet red, while the tissue elements, including hyaline and collagenous fibers, stained blue.

The difference in color was distinct. The stain fades after several days, and this unfortunately prevents making permanent sections. However, faded sections have been successfully restained with methyl violet, and the amyloid showed as distinctly as in the first staining. Cover slips were attached with glycerin. It was found empirically that sections cut at 8 to 10 microns (rather than the usual 4 to 6 microns) demonstrated the amyloid more clearly.

51. American Trudeau Society., Congo Red Test for Amyloid. *Am. Rev. Tuberc.* 45:103 (Jan.) 1942.

52. Taran, A., and Eckstein, A., The Standardization of the Congo Red Test for Amyloidosis. *Am. J. M. Sc.* 203:246 (Feb.) 1942.

53. Krajian, A. A., *Histological Technic*. St. Louis: C. V. Mosby Company, 1940.

■ *Analysis of the Data*

This study substantiates that of Selikoff and Robitzek: namely, gingival biopsy "can be of considerable value in the diagnosis of generalized amyloidosis."

Gingival biopsies taken from Group A's 20 unselected tuberculous patients showed no amyloid present, and a review of their clinical laboratory and necropsy reports corroborated the negative biopsy.

The seven positive biopsies correlated to a large degree with the clinical, laboratory and autopsy data. A brief study of two of these cases might well prove of value.

CASE 4, GROUP B—The patient was a 44 year old Negro woman with a hospital history of tuberculosis of five years. Roentgenographs showed evidence of fibrocalcific pulmonary disease. There existed a large cavity in the right upper lobe of at least five years' duration. This lesion showed a tendency to wax and wane. At present, the area shows consolidation with some attempt towards encapsulation of the area.

The liver was enlarged, being palpable 3½ fingers' breadth below the costal margin but no splenomegaly was noted. A 4 plus albuminuria was present on repeated urinalyses. The patient had a hypercholesteremia of 400 mg. per cent, with 250 mg. per cent cholesterol esters: the total serum proteins were high, 7.9 mg. per cent, but the albumin-globulin ratio was inverted (.80). The Congo red test rose from 50 per cent retention in October 1947 to 88.7 per cent in 1949. The gingival biopsy stained with methyl violet showed a profuse distribution of amyloid throughout. Thus both clinical and laboratory evidence coincided in the diagnosis of secondary amyloidosis.

The diagnosis was pulmonary tuberculosis, Grade III, far advanced with cavitation; secondary amyloidosis.

CASE 7, GROUP B—The patient was a 36 year old white man hospitalized for tuberculosis for eight years. Roentgenographically, there was evidence of long standing fibrocalcific disease. At present the activity is evidenced by multiple cavitations in the right lung field and high lights in consolidated areas on the left. The liver was enlarged and palpable 2½ to 3 fingers' breadth beneath the right costal margin and the spleen was enlarged and easily palpable. Repeated urinalyses showed a 4 plus albuminuria. The cholesterol level was 174 mg. per cent with 105 mg. per cent cholesterol esters. The total serum protein was 7.4 mg. per cent, but the albumin-globulin ratio was a low normal of 1.5. Two Congo red tests done at six month intervals showed a 97.3 per cent and 100 per cent retention. The gingival biopsy showed a minimal amount of amyloid deposited just beneath the rete pegs. In this case a diagnosis of secondary amyloidosis must be arrived at through the hepatosplenomegaly, albuminuria, Congo red tests and gingival biopsy, even though the fairly normal cholesterol and serum protein levels were not entirely in accordance with the classical picture described.

The diagnosis was bilateral pulmonary tuberculosis, Grade III, far advanced with cavitation; secondary amyloidosis.

In case 4, the patient had 88.7 per cent Congo red retention instead of the

diagnostic limit of 90 to 100 per cent. The patient in case 7 did not have a hypercholesteremia, and neither patient had a severely lowered total serum protein. The patient in case 7 did not have the usual inverted albumin-globulin ratio. In both cases, the demonstration of amyloid in the gingival biopsy with specific stain made more certain the diagnosis of amyloidosis.

■ *Comments*

This study conclusively demonstrated the presence of amyloid deposits in the gingiva. It confirms the findings of the only published work on the use of gingival biopsy for diagnosing generalized amyloidosis. Although only 7 proved cases were found, it should be noted that previous to this research, no known proved cases of amyloidosis were present at the Metropolitan Hospital. Furthermore, the advent of antibiotics, chemotherapeutic drugs and newer surgical technics have made generalized amyloidosis a far rarer disease than in former years.

It is interesting to observe that none of the 7 cases had every criterion present that is seen in a classical description of amyloidosis. All lacked one or more factors: six had definitely enlarged livers; five had palpable spleens; only three had Congo red absorptions between 90 and 100 per cent; four had hypercholestermia; four showed lowered total serum protein, and five had inverted albumin-globulin ratios. In each of these cases the diagnosis of generalized amyloidosis was substantiated by demonstrating amyloid material in the gingival biopsy with methyl violet.

Methyl violet was definitely the best stain to demonstrate amyloid: Congo red did not clearly demarcate the amyloid from hyaline and fibrous tissue, whereas the methyl violet did so in every case. The hematoxylin and eosin was virtually useless for differentiation. Diffuse daylight was better than artificial light in viewing the sections.

On the basis of this study it is felt that there is no correlation between the extensiveness of the general amyloid distribution and the amount found in the gingivae. In two cases where the patient had definite, severe generalized amyloidosis, the gingivae had a minimal deposit of amyloid. However, even a minimal deposit substantiates the diagnosis in those cases where the Congo red retention was not in the 90 to 100 per cent group, but was in the 80 to 90 per cent category. The gingival biopsy, which is relatively innocuous, might in the future be investigated from the viewpoint of following the progress of patients who are known to have the disease. Although there were no toxic or sensitivity reactions to Congo red in this study, the gingival biopsy should prove of value in patients who may have proved sensitive to the dye. There were no instances of ill effects following the gingival biopsy.

■ *Summary and Conclusions*

1. Generalized amyloidosis is often difficult to diagnose by the usual clinical criteria of hepatomegaly, splenomegaly, edema and proteinuria.

2. The Congo red absorption test is generally an excellent diagnostic test but it has several failings. It may cause untoward reactions; it may show a false positive (rare); it is not considered diagnostic unless 90 to 100 per cent is absorbed, leaving those from 60 to 89 per cent in

the negative group despite positive clinical findings.

3. Biopsy of the liver and the spleen has been used to diagnose amyloidosis but this is a formidable procedure. In a previous study gingival biopsy was shown to be of value in establishing the diagnosis. This present study substantiates these findings.

4. Twenty unselected tuberculosis patients underwent gingival biopsy without any amyloid being found. Then 450 patients with tuberculosis were screened for possible amyloidosis; 37 were selected for intensive investigation. This group was examined clinically for hepatomegaly, splenomegaly and edema; each patient was investigated for proteinuria, cholesterol levels, serum proteins and Congo red dye retention. A gingival biopsy was carried out on each patient.

5. Seven cases of generalized amyloidosis were found, each with a positive gingival biopsy. The microscopic sections were stained with a specific stain for amyloid; that is, methyl violet. All cases had clinical and laboratory evidence of sufficient strength to substantiate the diagnosis, even though all lacked at least one criterion of the classical picture.

6. There is apparently no demonstrable relationship between the amount of amyloid present in the gingivae and the severity of the disease.

7. There were no cases in this study of clinical amyloidosis without a positive gingival biopsy. The gingiva in all cases appeared clinically normal.

X-ray protection in dentistry

■ *Albert G. Richards, B.S. (Ch.E.), M.S., Ann Arbor, Mich.*

Overexposure of the human body to x-ray radiation can lead to unfortunate results; therefore certain precautions must be observed to provide adequate protection against excessive irradiation both for the operator and patient. It is the purpose of this paper to assemble the most recent authoritative information relating to x-ray protection in dentistry.

The x-rays utilized in dental roentgenography are generated at voltages ranging from 45 to 70 kv.p. (kilovolt peak) with 58 to 63 kv.p. the most commonly used values.

The primary or useful beam of x-rays generated by the x-ray apparatus travels in essentially one general direction, with the intensity[1,2] of the beam closely following the inverse-square law (the intensity of the x-ray beam varies inversely as the square of the distance). All particles of matter, when irradiated

Assistant professor of dentistry, School of Dentistry, University of Michigan, Ann Arbor, Michigan.

1. Landauer, R. S., Application of the Inverse-Square Law to Oil-Immersed Tubes. *Radiology* 48:175 (Feb.) 1947.

2. Singer, George, and Laurence, G. C., Materials and Methods of X-Ray Protection. *Radiology* 46:69 (Jan.) 1946.

by the primary x-ray beam, become sources of secondary or scattered rays. These secondary rays are usually less intense and may be of longer wave length than the primary rays. These rays do not follow the inverse-square law, and they travel in all directions. Both the primary and secondary rays must be considered, however, when devising methods of protection against undue irradiation. Time, distance and protective barriers are the means commonly used to reduce radiation hazards.

■ *Operator Protection*

During the last half century, various permissible dosage rates have been suggested as the maximum total dose to which any part of the operator's body should be permitted to be exposed continuously or intermittently in a given period of time. The recommended dosage rate has steadily decreased throughout the years,[3-8] until now it is taken as 0.300 r per week.[9]

In order to achieve protection against undue irradiation, the operator and all other personnel habitually in the region of the x-ray apparatus must observe two rules:[9,10]

1. Never stand in the path of the primary or useful x-ray beam. If the x-ray unit is in an adjacent room, be sure that the intervening wall is composed of 0.8 mm. of lead, or 0.17 inch thick sheet steel, or 3½ inches of brick or concrete.

2. Distance alone will provide adequate protection from the secondary or scattered rays which originate in the patient, provided the distances and workload limits shown in the graph are observed. (Note: The distances are measured from the patient to the operator at the time of exposure, and the corresponding permissible total length of time for operation of the x-ray apparatus is measured in seconds alone, and not in milliampere-seconds. These data apply to dental x-ray units operated at potentials up to 70 kv.p. and 10 milliamperes with a target-skin distance of 8 inches.)

Under no condition should the operator or any regular assistant hold a film packet in the patient's mouth during an exposure. In case of an emergency, a relative or some other person not habitually exposed to x-rays should hold the film.

To reduce the amount of secondary radiation produced during an exposure, a diaphragm with a small aperture should be used to reduce the diameter of the x-ray beam to the smallest practical size.

If the conditions contained in the graph cannot be fulfilled, then structural shielding is necessary for the operator. The shields described in the first rule are considered adequate for this purpose.

The amount of radiation received by an individual working in the vicinity of an x-ray apparatus may be recorded by a "fountain pen" type of ionization chamber. Although this equipment provides the most accurate method of testing it is

3. Quimby, Edith H., *The Tolerance Dose or Tolerance Intensity. Radiology* 46:57 (Jan.) 1946.

4. Morgan, K. Z., Radiation Safety Measures in an Atomic Energy Plant. *Engineering J.* 31:154 (March) 1948.

5. Sproull, W. T., *X-Rays in Practice*. New York: McGraw-Hill Book Company, Inc., 1946, p. 201.

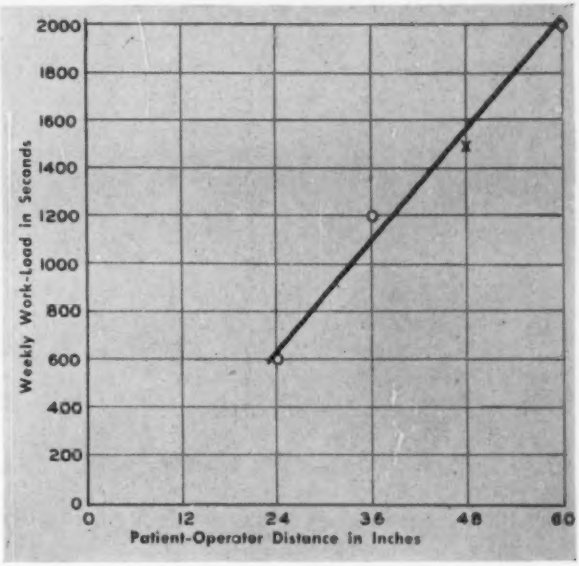
6. Failla, G., Biophysical Factors in X-Ray Use. *Industrial Standardization* 17:112 (May) 1946.

7. Sievert, R. M., The Tolerance Dose and the Prevention of Injuries Caused by Ionizing Radiations. *Brit. J. Radiology* 20:306 (Aug.) 1947.

8. Henshaw, P. S., Irradiation Injury and the Tolerance Dose. *Radiology* 44:569 (June) 1945.

9. National Bureau of Standards Handbook 41, *Medical X-Ray Protection up to Two Million Volts*. Washington: National Bureau of Standards, U. S. Department of Commerce, March, 1949.

10. Protection of Dental X-Ray Technicians From Irradiation. *Med. News Letter* 13:23 (Jan. 14) 1949.



Graphic representation of the operator's permissible weekly workload limit as a function of the patient-operator distance. (X= footnote 9; O=footnote 10)

not widely used by dentists because of the cost.

Another means to estimate exposures received by personnel is a commercially available "film badge" which the x-ray worker wears for a specified number of days. The test film in the badge is analyzed carefully, and the x-ray worker is notified of the results of the test. If the results indicate that he is receiving radiation faster than at the permissible dosage rate, greater vigilance and more adequate protection measures obviously are necessary.

As a simple radiation test, which is of an approximate nature only, a Radia-Tized dental x-ray film packet may be worn for a period of two weeks over the breast or carried in pockets of the clothing, with the tube side of the packet away from the body. The film then should be developed in fresh developer at 68 F., with the film being agitated at the end of every minute. A liberal allowance should be made for any possible deviation from the correct developing conditions. The protective measures should not be considered to be sufficient unless the density of the film, when placed over a newspaper is considerably less than that required to obscure the readability of ordinary newsprint.[11,12]

■ *Patient Protection*

With dental x-ray units operating at potentials up to 70 kv.p. and 10 milli-

11. Wilsey, R. B., Personal communication, July 18, 1949.
12. Eastman Kodak Company, Medical Division. *The Fundamentals of Radiography*, ed. 6, Rochester: Eastman Kodak Company, 1947, p. 105.

amperes, overexposure of the patient can be avoided by observing two precautions:[13,14] (1) with a focal-skin distance of 8 inches,[15] no more than 600 ma.s.[16] of exposure should be administered to the front or either side of the face within a period of two weeks; (2) if a given skin area receives an exposure of 600 ma.s. at one sitting, no additional exposure should be given that region for a period of two weeks. This amount of exposure should be approached only if it is known that the face has not recently been subjected to radiation for roentgenography or roentgen therapy.

Many dental investigators have reported 1,200 ma.s. as the erythema dose and 600 ma.s. as the safety dose. The safety dose was determined by applying a safety factor of 50 per cent to the erythema dose. This factor is necessary to allow for back scattering of the secondary rays, for differences in the radiosensitivity of human skin and for mechanical variables. Due to the cumulative or additive effect on the body of exposure to x-rays, a time factor of two weeks was introduced. No research data have been presented upon which the figures of 1,200 ma.s. and two weeks might be based. An investigation to determine accurately the erythema dose and the rate of recovery of the skin when irradiated at 50 to 65 kv.p. under dental office conditions has been initiated.

As a protection against unnecessary exposure of the skin through needless overlapping of the fields, the circle of useful radiation should be restricted by a lead diaphragm to the smallest practical diameter.[9,13,14,17]

Investigators appear to agree that there are some people whose skin is more sensitive than others to the action of x-rays, but opinions differ as to whether or not radiosensitivity varies in the same manner as sensitivity to sunlight. Warren[18] and Morgan[4] state that the erythema dose may vary as a function of pigmentation, with blondes being most sensitive and Negroes least. Herrmann and Pack[19] found no appreciable variation in the intensity of the erythema reaction on the basis of sex or complexion. Old people, with dry atrophied skin, are considered less susceptible than others.[19]

The erythema dose is considered[5,17,18,20,21,22] to be a function of the wave length and it decreases with the softness of the radiation.

Even though the use of the dental x-ray unit for roentgen therapy is contraindicated, the dentist must be fully cognizant that whenever deep roentgen therapy is to be used in treating oral cancers, all teeth that will not be screened from the beam of radiation must be removed at

13. General Electric X-Ray Corporation. *Manual of Operative and Radiographic Technic.* Chicago: General Electric X-Ray Corporation, 1934.

14. Ritter Company, Inc. *Use of the Modern Dental X-Ray Unit.* Rochester: Ritter Company, Inc., 1947, pp. 4-6.

15. Application of the inverse-square law indicates that for other focal-skin distances the following exposures would be considered safe:

Focal-skin distance in inches	*Exposure in ma.s.*
12	1350
16	2400
20	3750

16. Milliampere seconds are computed by multiplying the milliamperes of current passing through the x-ray tube by the seconds of exposure.

17. MacKee, G. M., and Cipollaro, A. C., *X-Rays and Radium in the Treatment of Diseases of the Skin,* ed. 4. Philadelphia: Lea & Febiger, 1946. pp. 261-3.

18. Warren, Shields, Effects of Radiation on Normal Tissues. XIII. Effects on the Skin. *Arch. Path.* 35:340 (Feb.) 1943.

19. Herrmann, J. B., and Pack, G. T., Variations in Sensitiveness of Different Skin Areas to the Erythema Dose of Roentgen Exposure. *Am. J. Roentgenol.* 51:504 (April) 1944.

20. Hudson, J. C., The Dependence of X-Ray Erythema on Wave Length. *Radiology* 29:95 (July) 1937.

21. Andrews, G. C., and Braestrup, C. B., Skin Erythema Dose in Terms of Roentgens in Superficial Therapy. *Am. J. Roentgenol.* 29:663 (May) 1933.

22. Reinhard, M. C., Variations in Dosage Dependent on Wave Length. *Am. J. Roentgenol.* 31:538 (April) 1934.

least one week prior to the irradiation. Once treatment has been given, none of the teeth exposed to irradiation should ever be extracted.[23-26] Extraction may open up the spaces of the partially devitalized bone to infection, producing an uncontrollable osteomyelitis with extensive loss of bone.[24, 26]

■ *Summary*

Two rules are listed which must be observed by the operator and other personnel to achieve protection against undue irradiation in the region of the x-ray apparatus.

Methods are given for measuring the amount of radiation received by an individual in the vicinity of x-ray apparatus.

Two rules are described which must be observed to avoid overexposure of the patient by radiation from the dental x-ray apparatus.

Precautions are listed which pertain to the use of deep roentgen therapy in the treatment of oral cancers.

23. del Regato, J. A., Dental Lesions Observed After Roentgen Therapy in Cancer in the Buccal Cavity, Pharynx and Larynx. *Am. J. Roentgenol.* 42:404 (Srpt.) 1939.

24. Brandon, S. A., and Herd, R. M., Report of Case and Management of Radiation Necrosis of the Mandible. *Oral Surg., Oral Med. & Oral Path.* 2:987 (Aug.) 1949.

25. Daland, E. M., Radiation Necrosis of the Jaw. *Radiology* 52:205 (Feb.) 1949.

26. Dingman, Reed O., and Hayward, James R., Diagnosis of Oral Tumors. *J.O.S.* 7:217 (July) 1949.

A roentgenographic study of the pterygopalatine injection for blocking the maxillary nerve

■ *Leonard Szerlip, D.D.S., Morristown, N. J.*

The reluctance and anxiety associated with the use of a second division block, and my belief that these are unfounded, resulted in the roentgenographic study herein presented.

In order to better demonstrate the anatomic landmarks and salient factors in the technic advocated in a previous article,[1] roentgenograms with the needle *in situ* were taken on a dry specimen as well as on patients.

Locating the greater palatine foramen by palpation, the needle is inserted in the previously dried and surgically prepared tissue. A few drops of anesthetic solution are deposited to insure anesthesia of the soft tissue should difficulty in locating the foramen be encountered. The syringe is held at an angle of approximately 60 degrees from the occlusal plane of the maxillary teeth, the long axis of the barrel being parallel to the sagittal plane of the head. The needle is inserted to a previously determined depth following the technic as advocated by Jorgensen.[2] (By subtracting 3 mm. from the measurement of the dis-

1. Szerlip, L., The Pterygopalatine Injection for Blocking of the Maxillary Nerve. *J.O.S.* 6:135 (April) 1948.

2. Jorgensen, N. B., Measurements for Intra-Oral Block of the Maxillary Nerve. *J.O.S.* 6:1 (January) 1948.

Fig. 1.—Posteroanterior view of a patient showing a needle in place in the pterygopalatine canal

tance from the infraorbital margin to the gingival margin of the bicuspid the depth of penetration of the needle necessary for optimum anesthesia in 96 per cent of the cases may be determined.)

If the needle has entered the greater palatine foramen and is in the pterygopalatine canal, relatively little resistance will be met in the insertion. Success with this technic is manifested when the patient experiences numbness in the lateral nasal region, the infraorbital region and the lip. Two to four cubic centimeters of anesthetic solution will produce profound anesthesia of the maxilla, lasting from 1½ to 2 hours.

■ *Indications and Advantages*

The second division block is indicated when extensive anesthesia of the maxilla is necessary. It is important when operating on the maxillary antrum in order to block the sphenopalatine ganglion since the inner wall of this sinus is supplied by the nasopalatine nerve. It is desirable when operating on an impacted upper third molar whose roots are located above the posterior superior alveolar canal and cannot be reached by means of the ordinary tuberosity injection. This approach to the maxillary nerve permits indicated surgical procedures in the presence of swelling and infection of the soft tissues, when general anesthesia is not available or is contraindicated.

The certainty of landmarks when approaching the maxillary nerve through the pterygopalatine canal makes for more positive results than in any other approach to the second-division block. Not only does the needle traverse the shortest route of any technic to blocking the maxillary nerve, but it avoids the possibility of a hematoma as the result of puncture of the pterygoid plexus of veins as well as the possibility of injection into the buccal pad of fat.

■ *Roentgenographic Study*

From the posteroanterior view (Fig. 1) the relationship of the needle to the floor of the orbit is evident, exhibiting the fact that the point of the needle does not penetrate the orbit. However, its proximity to the orbit evinces the possibility of anesthesia of the ophthalmic branch of the fifth cranial nerve as it passes from the cranium through the superior orbital fissure, resulting in transient double vision. This view also bears out the fact that the long axis of the pterygopalatine canal and that of the sagittal plane are parallel, demonstrating more vividly the path of insertion of the needle. One further point

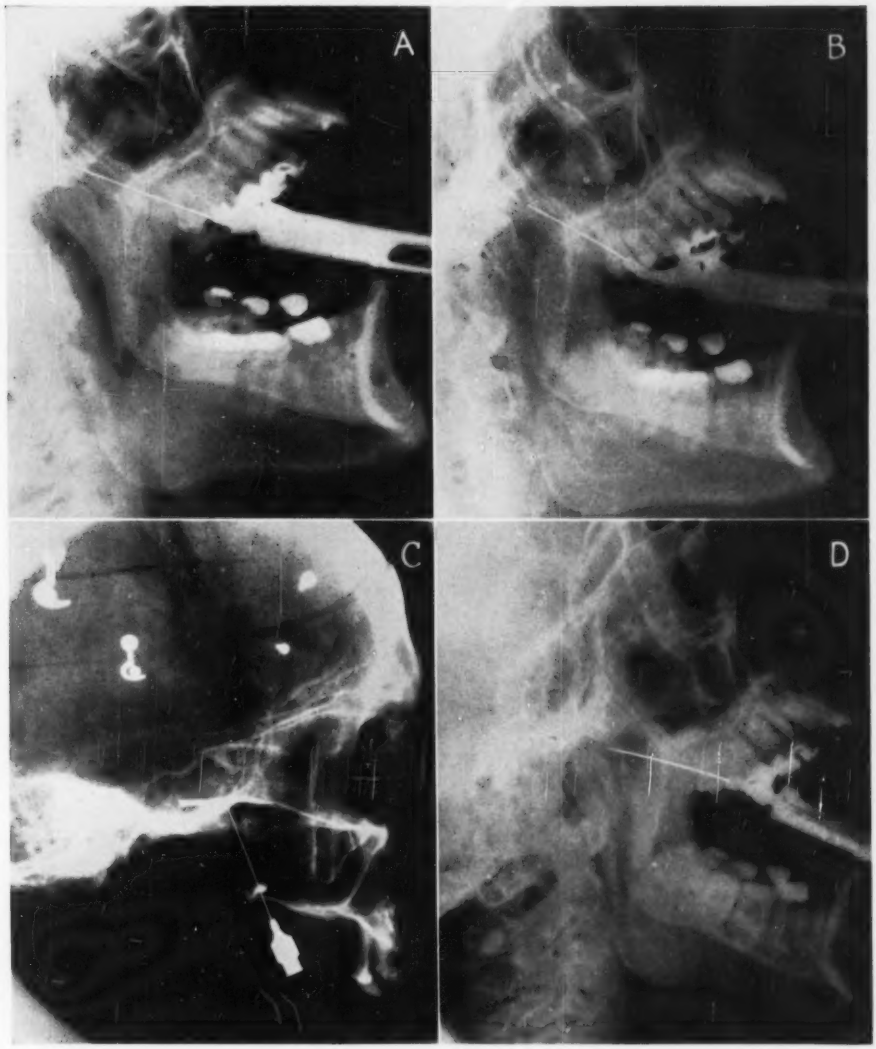


Fig. 2.—A: Lateral view of a patient with the needle of an ordinary carpule type syringe in place in the pterygopalatine canal. B: Lateral view of a patient with a needle with a curved hub in place in the pterygopalatine canal. C: Lateral view taken on a dry specimen. Gutta-percha has been used to mark the course of the maxillary nerve as it leaves the skull through the foramen rotundum, crosses the pterygopalatine fossa and enters the orbit through the inferior orbital fissure. Gutta-percha also marks the greater palatine foramen. A needle is in place in the pterygopalatine canal. D: Lateral view of a patient showing the needle misdirected and lodged in the nasopharynx

may be gathered from this view: the relative position of the greater palatine foramen to that of the midline. The foramen is found approximately 15 mm. lateral to the median line, a more exact anatomic landmark in locating the foramen than the recommended relationship of the teeth to the foramen.

The lateral views (Fig. 2, *A* and *B*) not only serve to show the relationship of the needle point to the cranium (again demonstrating the fact that the needle does not penetrate the calvaria), but also show the angle of insertion of the needle and the path it follows.

On the dry specimen (Fig. 2, *C*) the course of the maxillary nerve is in part marked out with gutta-percha, as is the greater palatine foramen. Thus the relative distance between these two points is more strikingly exhibited.

Included is a roentgenogram showing the location of the needle when misdirected (Fig. 2, *D*). This roentgenogram shows the needle to have slipped beyond the hard palate, penetrating the soft palate and coming to rest in the nasopharynx. The patient may taste the anesthetic solution in such a case, but no harm would result.

■ *Conclusions*

The dangers of blocking the maxillary nerve through the pterygopalatine canal are far less than those of any other approach and the injection is deserving of more widespread use.—*10 Park Place.*

■ External Fixation in Mandibular Fractures

The present methods of external fixation of fractures of the mandible are logical refinements of similar fixation of the long bones; these will undoubtedly pass through a further developmental stage before reaching a permanent place in the treatment of mandibular fractures. Although there are many possibilities for its employment when indicated, the authors warn against the indiscriminate use of skeletal fixation. Illustrations and roentgenograms of published case reports show this type of immobilization applied when simpler procedures could have been used with greater assurance of achieving occlusal restoration.—*V. H. Kazanjian and J. M. Converse, "The Surgical Treatment of Facial Injuries." Baltimore: The Williams and Wilkins Company, 1949.*

VOLUME 8 • OCTOBER 1950 • NUMBER 4

CASE REPORTS

Congenital anomalies of the floor of the mouth and of the mandible: *report of two cases*

■ *Sadi B. Fontaine, D.D.S., Oakland, Calif.*

Even though one may have years of experience in the practice of oral surgery, occasionally one will encounter conditions which are extremely rare or perhaps unique.

Congenital anomalies of the frontonasal and the maxillary processes are not infrequent; cleft lip and cleft palate are familiar examples.

Congenital malformations of the mandible and of the structures of the floor of the mouth, however, are extremely rare. The first case reported is unique. No similar condition has been previously recorded in the literature, or in the medical record files of the larger medical centers in this country. The second case is reported because this anomaly is rare and its treatment has been simplified.

CASE 1—A 16 day old baby girl was admitted to the Highland-Alameda County Hospital on February 18, 1936, for correction of malformations of the mandible and floor of the mouth.

There were no known previous cases of congenital malformations in the family. Father and mother were living and well. This baby was their first child.

The baby was born at home; her delivery was normal and the mother suffered no complications following parturition. The baby was unable to hold a nipple in her mouth because of her oral malformations. She had to be fed with a medicine dropper.

Physical examination showed all systems essentially negative. The eyes, ears and nose were clear. The upper lip and the hard and soft palate were normal. The lower lip was inverted lingually by a band of soft tissue which appeared to be a hyperplastic frenum composed of skin and mucous membrane (Fig. 1). This band began at the mucocutaneous border of the middle of the lower lip and it extended posteriorly along the top of a bony arch in the center of the floor of the mouth. The floor of the mouth was divided into two compartments by an arch of bone which was firmly attached to the lingual plate of the mandibular symphysis and to the lingual plate of the right mandibular body near the retromolar fossa (Fig. 2).

The larger compartment was in the left side of the floor of the mouth and it contained the normal tongue. The tongue was in the oropharynx; its tip pointed upward.

In the right compartment were three, freely movable, redundant masses of tissue. A smooth, firm, oval mass which was attached to the alveolar crest of the right mandibular body, and two reddish masses of tongue tissue which arose from the floor of the mouth. One tongue was similar in size and shape to a kitten's tongue; the other tongue was cylindrical in shape.

Occlusal view roentgenograms taken of the floor of the mouth showed that the middle body of the mandible contained teeth.

Urinalysis and blood count were normal.

A three stage plan of reconstruction was decided upon.

Fig. 1.—Photograph of the baby showing the maldevelopment of the oral structures

On March 14, 1936, under an intranasal, insufflation ether anesthesia, the smooth, pedicled, bony mass was excised from its attachment to the mandible. The surgical wound was closed with 000 chromic catgut sutures. Next, the two supernumerary tongues were removed from the floor of the mouth by sharp and blunt dissection. These wounds were closed with 000 chromic catgut sutures. After hemostasis was obtained, the baby was returned to bed in good condition.

The pedicled, bony mass removed at sur-

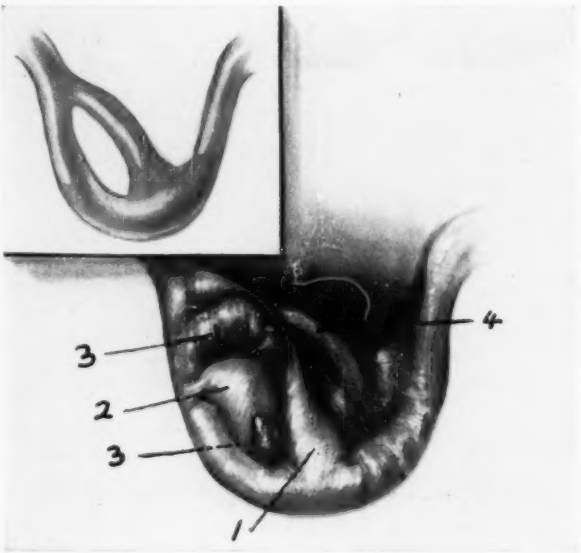


Fig. 2.—Drawing showing the relation of the structures: 1, middle body of the mandible; 2, lobulated mass of alveolar bone attached to the right body of the mandible; 3, the supernumerary tongues; 4, normal tongue in the left oropharynx. Inset shows diagram of the three mandibular bodies

gery was incised and it was found to contain two deciduous molar buds. Figure 3 shows the specimens removed at this operation.

On the fourth postoperative day the baby was discharged from the hospital in good condition. She was now able to take her feedings with a nipple. An occlusal view roentgenogram taken at this time showed all three mandibular bodies contained teeth (Fig. 4, left).

Laboratory findings were essentially normal and of no special significance.

The second operation was performed on May 15, 1936. Intranasal, insufflation ether anesthesia was administered. Mosquito forceps were placed on the hyperplastic frenum at a point below where the frenum held the lower lip in an inverted position. By sharp and blunt dissection the lower lip was freed and turned outward. After obtaining hemostasis, the oral end of the frenum was sutured with 000 chromic catgut. The redundant skin and mucous membrane on the midportion of the lower lip were removed by sharp dissection. After contouring the lip to a normal roll, the wound was closed with horsehair sutures. The baby was in good condition.

On November 7, 1937, the baby was readmitted to the hospital for the last stage of surgery. She was 21 months old and in good health. It was thought that she had reached the age where her physical condition was sufficiently strong to withstand the major procedure of having the middle body of the mandible removed.

Physical examination revealed nothing remarkable except that an interesting change was observed in the anatomic position of the middle body of the mandible. The tongue, in an attempt to attain its normal position in the floor of the mouth, had forced the middle body of the mandible laterally until it came in contact with the right mandibular body. The right compartment in the floor of the mouth had been completely obliterated except for a narrow crevice between the middle and the right mandibular bodies (Fig. 4, right).

On November 8, 1937, under an intranasal, insufflation ether anesthesia, the third operation was performed. An incision was made

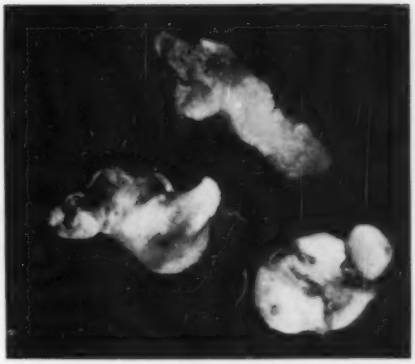


Fig. 3.—Photograph of the specimens removed at the first operation showing the supernumerary tongues and the lobulated mass of alveolar bone which contained teeth

through the mucosa along the entire length of the crest of the middle body of the mandible. By sharp and blunt dissection the soft tissues were detached from the periosteum until the middle body was completely exposed. With a thin chisel the bone was sectioned from its anterior and posterior attachments to the mandible and removed. Next, the sectioned surfaces on the mandible were trimmed smooth with rongeurs. After cutting away the excess mucosa, the floor of the mouth was closed with 000 chromic catgut sutures. A small Penrose drain was inserted into the wound to promote drainage.

As soon as the middle body was removed from the floor of the mouth, the tongue assumed its normal position spontaneously.

The operative time was one hour and the baby left the operating room in very good condition.

Three hours after the operation the baby died.

An autopsy disclosed that death had been due to an internal hemorrhage. There was a tear in the stomach wall which was approximately 2.5 cm. long.

Evidently the nasal catheter used for insufflation anesthesia had been placed too close to the esophagus and some ether got into the

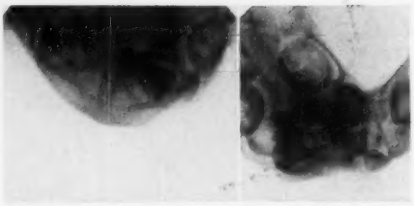


Fig. 4.—Roentgenograms of the floor of the mouth (occlusal views) showing the three mandibular bodies contained teeth. Left: Taken shortly after the first operation. Right: Taken a few days before the third operation. The middle body of the mandible is now in contact with the right mandibular body

stomach. An acute dilatation of the stomach, with rupture, resulted.

This baby was born with a unique case of oral malformation, and the cause of her death was unusual and tragic.

CASE 2—A baby girl was born with an atresia of her left submaxillary duct.

Family history was essentially negative and noncontributory. Both parents were living and well. This was their first baby.

The nurse in charge noticed a cystic swelling in the floor of the baby's mouth.

Physical examination showed all systems were essentially negative and she had the appearance of a well baby. The left submaxillary salivary gland was palpable but it was not tender to digital pressure. In the floor of the mouth, over the region of the left submaxillary duct, a cystic swelling was observed which measured about 1.5 cm. in length. Fluctuation could be felt on palpating the swelling. Inasmuch as the cystic swelling was over the terminal end of the submaxillary duct, and the salivary gland itself was enlarged, there was evidently a cystic dilatation owing to an imperforation of the duct.

The diagnosis was acute retention cyst secondary to a congenital atresia of the left submaxillary duct.

On September 27, 1946, under nasopharyngeal, insufflation ether-oxygen anesthesia, a 20 gage silver wire, pointed at one end and bent in the shape of a figure 6, was intro-

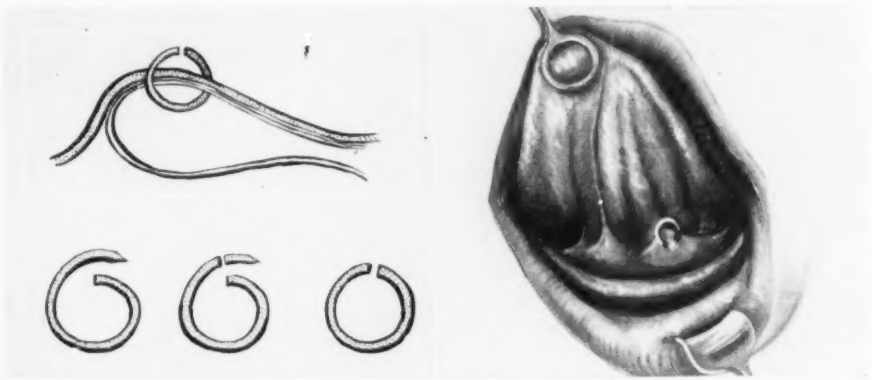


Fig. 5.—Left, above: Diagram illustrating the distended salivary cyst and the overlying oral mucosa. The method of applying the silver ring is also outlined. Left, below: Method of shaping and cutting the silver ring. Right: Drawing illustrating the silver ring in position in the floor of the mouth

duced through the dome of the cyst. The wire entered the cyst on the posterior aspect of the dome and only the pointed end emerged from its anterior surface. With wire scissors, the sharp end of the wire was cut off and removed. The two ends of the wire which emerged from the dome of the cyst were bent to form a ring and closed end to end. The diameter of the closed ring for clinical use is from 5 to 7 mm. This smooth, silver ring provided two channels through which the saliva could escape.

During the introduction of the wire the cyst emptied itself and remained collapsed thereafter. The baby was returned to her ward in good condition. Duration of anesthesia and surgical procedure was 15 minutes.

Feedings were taken on schedule and without difficulty. Forty-eight hours after the introduction of the wire the submaxillary salivary gland was no longer palpable.

Six weeks later the silver ring was opened and removed. This left two well epithelized lumens in the submaxillary duct which permitted a free flow of saliva.

COMMENTS—The application of a seton in the treatment of retention cysts is not a new procedure. All textbooks on oral surgery describe this operation. However, the procedure usually consists of passing through the dome of the cyst with a needle, heavy catgut or silver wire which is tied or twisted to form a loop. This modification of the operation eliminates the use of a needle for passing the wire; and the smooth end-to-end closure of the silver ring prevents the irritating trauma to the soft tissues in the floor of the mouth which is inflicted by the sharp tail of the twisted wire.

SUMMARY—Two cases of congenital anomalies have been reported in this paper. One case had congenital malformations of the lower lip, mandible and tongue. The other case had an acute retention cyst due to an imperforation of the left submaxillary duct. The clinical findings are described, and the surgical procedures used in the correction of these malformations are given in detail.—*1904 Franklin Street.*

Extraoral removal of an impacted lower third molar: *report of case*

■ *Ralph O. Christensen, D.D.S., Minneapolis*

A well developed white woman, aged 45, was referred by her dentist on October 2, 1946. The patient complained of a hard, nonfluctuant, board-like swelling of the right mandibular area, pain and trismus.

On September 25, 1946, the patient noticed swelling at the angle of the right mandible. It increased in size and became hard, tender and red. She experienced a driving pain which seemed to radiate from time to time to the top of her head. There was an impacted lower third molar on that side.

Examination revealed an inflammatory swelling at the angle of the mandible on the right. On palpation, the mass was hard, tender, nonfluctuant, extended laterally from the right commissure of the mouth along the body of the mandible to the ramus and upward to the zygoma. Intraorally, the retromolar area on the right was swollen; trismus interfered with satis-

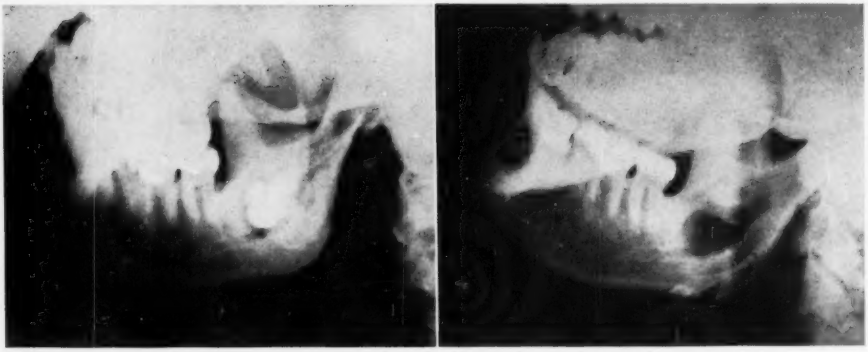


Fig. 1.—Left: Preoperative roentgenogram showing severely impacted lower right third molar. Right: Postoperative roentgenogram revealed the tooth was completely removed

factory intraoral inspection. Temperature was 102.5 degrees.

The physical examination was essentially negative except for the mandibular involvement.

Extraoral roentgenographic examination revealed a severely impacted lower right third molar (Fig. 1, left).

TREATMENT—Antibiotic and chemotherapeutic treatment was instituted. From October 2 through October 8 the course was stormy with spiking temperature readings from 99.7 to 103 degrees. On October 4 the patient developed an erythematous rash, and sulfathiazole was discontinued. On October 5, an aspiration biopsy of the swollen area was attempted with

Fig. 2.—Roentgenogram taken three months later showed the defect in the ramus to be filling in with bone

negative results. Between October 8 and October 14, the swelling subsided considerably and after consultation with members of the medical staff, it was agreed the swelling was caused by an inflammatory reaction about the impacted third molar, and immediate removal was indicated. Inasmuch as the trismus had not abated, extraoral removal seemed indicated.

OPERATION—On October 16, the patient was given preoperative medication consisting of ¼ grain morphine sulfate and 1/150 grain atropine. Under cyclopropane, oxygen and ether anesthesia, a curved incision 6 cm. long was made through the skin, superficial fascia and the platysma, 1 cm. below the inferior border of the mandible. The external maxillary artery was located, ligated and cut. The skin was reflected upwards exposing the inferior part of the parotid gland and the masseter muscle. The masseter muscle was divided in the direction of its fibers, exposing the periosteum which was incised and reflected. The position of the tooth was plotted by means of a protractor from the roentgenogram to the bone itself. A window was cut with osteotomes in the lateral surface of the ramus. The tooth was exposed and removed, along with what appeared to be chronic inflammatory granulation tissue. The periosteum was closed with interrupted 000 chromic sutures and the subcutaneous tissues were closed in layers with 000 chromic sutures; the skin was closed with 000 silk. Petrolatum gauze and a pressure dressing were applied over the wound.

Postoperative extraoral roentgenographic examination revealed the tooth was completely removed (Fig. 1, right).

The pathologic examination showed the tissue to be granulation tissue, which had the appearance of a reaction to an infection, rather than a tumor.

COURSE—The postoperative course was uneventful. The sutures were removed on the fifth postoperative day with healing by primary intention. The patient was discharged from the hospital on October 25. On January 30, 1947, she was seen again. There was no recurrence of swelling, pain or trismus. A roentgenogram showed the defect in the ramus to be filling in with bone (Fig. 2). There was a slight scar along the lower border of the mandible.—829 *LaSalle Building.*

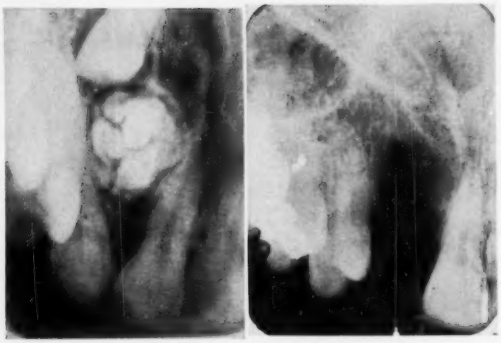
Compound composite odontoma:

report of case

■ *C. D. Gwinn, D.D.S., San Francisco*

A young lady 17 years old had been a patient in the University of California Medical Clinic for disorders having no connection with her mouth. However, the four third molars had been removed some months previously, and the patient complained of occasional pain on the upper right side. A small sequestrum was removed from the upper right third molar region. Dental roentgenograms revealed the presence of a compound composite odontoma in the upper right lateral incisor region. The upper right lateral incisor was unerupted and was situated at the apex of the right cuspid. Below this was a mass in which could be distinguished a number of denticles (illustration, left). It was decided to remove the odontoma.

The operation was performed under ether anesthesia on April 5, 1938. The tissue was



Left: Compound composite odontoma in the upper right lateral incisor region. Right: Region after three years. The dark streak seen above the crest of the ridge is evidently caused by the resorption of the thin labial plate of bone during healing and by its replacement with fibrous tissue instead of bone

turned back lingually making the incision around the lingual gingival margins of the central incisors, the right cuspid and first and second bicuspids. The tissue was elevated and no vertical incision in the palate made. The lower part of the odontoma was exposed and the denticles removed. There were 12 of them. They were enclosed in membrane, were separate from one another and had no bony attachment. When removed a cavity was left extending almost through the labial plate. At the upper border of the cavity the crown of the lateral incisor could be seen apparently resting against the root of the cuspid near its apex. It was thought that the incisor could not be removed without serious damage to the cuspid. The cuspid was extracted and it was found that its root had been resorbed near the apex where the crown of the lateral incisor had been in contact with it. The crown of the lateral incisor was further exposed, using mallet and chisel, and the tooth was removed.

After smoothing the bony margins of the cavity the flap was returned to place and the wound closed with 00 plain catgut sutures. No drain or packing was placed in the wound. Healing was uneventful and the patient was dismissed from the hospital after four days. The illustration, right, shows the bone condition after three years. The dark streak seen above the crest of the ridge is evidently caused by the resorption of the thin labial plate of bone during healing and by its replacement with fibrous tissue instead of bone.—*490 Post Street.*

■ GREAT MEN

Great men and insignificant men have like accidents, like vexations and like passions; but the former are on the outside of the wheel and the latter near the center, and therefore less agitated by the same movements.—*Pascal.*

VOLUME 8 • OCTOBER 1950 • NUMBER 4

The problem of nutrition in oral surgery

THE PROBLEM OF NUTRITION in cases of facial fractures and in other cases requiring immobilization of the jaws has long been recognized by oral surgeons. But the problem of nutrition is not limited to these cases. Fortunately, most patients seen for office treatment are well nourished, and nutrition is not a factor in the etiology of the disease.

It is presumptuous to assume, however, that all patients are in an adequate state of nutrition. The highly refined American diet in many instances does not provide the necessary elements of a balanced nutritional state. Many patients well able to afford a balanced diet are literally starving for certain food elements.

Malnutrition may result in diseased states of the oral tissues, in lack of response to accepted therapeutic measures, or in the delay or absolute failure of the processes of repair and recovery. The persistent dry socket, the delayed union or nonunion of fractures and the development of secondary infections following surgical procedures may all result from lack of the nutritional elements essential to the process of repair.

In cases requiring extensive surgical procedures the patient should be in the best possible nutritional state before surgical procedures are undertaken.

The postoperative diet should be high in protein, vitamin and mineral content. Calcium, phosphorus and iron are essential to wound healing, as are vitamin A, nicotinic acid and riboflavin.

A liquid diet, necessary in cases requiring intermaxillary fixation, can become monotonous unless it is prepared with care and imagination. A liquid diet consists mainly of dairy products, puréed vegetables and fruit juices. Protein can be provided by using meat broth or soup and by using eggs in liquid form or in custard.

The oral surgeon should become more conscious of the necessary elements for the maintenance of adequate nutrition, and should advise and supervise patients in this important part of their therapy.—*Reed O. Dingman.*

HARRY BEAR

HARRY BEAR, dean of the Medical College of Virginia, School of Dentistry, and secretary of the American Society of Oral Surgeons, died on July 30, 1950, after a brief illness.

Dr. Bear was born in Richmond, November 20, 1890. He attended the public schools of Richmond and Richmond College prior to entering the Medical College of Virginia, where he studied dentistry. He was graduated from the Medical College of Virginia in 1913 and entered the general practice of dentistry. Shortly thereafter he undertook postgraduate studies and limited his practice to exodontia and dental roentgenology.

Soon after graduation Dr. Bear began his teaching career at the Medical College of Virginia as a part time instructor in metallurgy. He rose rapidly to the rank of professor of exodontia and of dental jurisprudence, ethics and economics. He was appointed dean of the School of Dentistry on July 1, 1929. On January 1, 1946, he retired from private practice to devote his full time to the deanship. During Dr. Bear's administration of the Medical College of Virginia, School of Dentistry, the physical facilities, student enrolment and faculty were greatly expanded.

Dr. Bear gained nation-wide recognition as an authority in his special field of practice, as a teacher and as a college administrator. He made numerous contributions to the dental literature. His counsel was widely sought. In 1945 Temple University bestowed the honorary degree of Doctor of Dental Science upon him.

Dr. Bear was a Fellow of the American College of Dentists, a member of the American Society of Oral Surgeons, the International Association for Dental Research, the Pan American Odontological Association, the American Dental Association and numerous other national and local professional societies.

He was a past-president of the Richmond Dental Society, the Virginia State Dental Association, the American Association of Dental Schools and the American Society of Oral Surgeons. He had served as secretary of the latter organization continuously since 1933. In addition, he served as vice-president and trustee of the American Dental Association. He served for many years in the House

of Delegates of the Association as delegate from Virginia. He was an honorary member of Sigma Zeta and a charter member of the Kappa chapter of the Omicron Kappa Upsilon honorary dental fraternity. He was a member of Congregation Beth Ahabah and at one time served on its Board.

During World War II Dr. Bear was a member of the Dental Committee of the Third Corps Area, Procurement and Assignment Service. He was also a regional consultant to the Veterans Administration on dental service.

He was a man of great personal charm and warmth, untiring in his devotion to his family, to his numerous friends and to his professional endeavors. His influence on his faculty and students was reflected in their great esteem for him as an administrator, teacher and counsellor. His efficiency in dental organization leadership brought him many honors. He taught his students and contemporaries high professional ideals by example.

Dr. Bear was married in 1917 to Betty Gellman, who died in 1934. He was married to Mrs. Elsa B. Strause in 1941.

Dr. Bear is survived by his wife, two sons, both dentists, David M. and S. Elmer, three daughters and six grandchildren.

VOLUME 8 • OCTOBER 1950 • NUMBER 4 SURGICAL ORAL PATHOLOGY

The biopsy

■ *Joseph L. Bernier, D.D.S., M.S., and Richard W. Tiecke, D.D.S., M.S., Washington, D. C.*

In previous issues of the JOURNAL OF ORAL SURGERY this section contained case reports from the files of the Registry of Oral Pathology of the American Dental Association. Approximately 700 specimens from varied sources are received monthly by the Registry, many of which pose difficult diagnostic problems because of carelessness or thoughtlessness on the part of the clinician. The six cases published in the previous two issues are examples of biopsy or surgical specimens properly submitted by careful operators as evidenced by the complete histories and the clear photomicrographs which would not have been so clear if the tissue had not been received in proper condition. In view of this it seems appropriate to discuss the principles of biopsy in order that the clinician who undertakes the procedure may receive the maximum in assistance from the pathologist.

Early diagnosis is of the greatest importance in the attack upon malignant tumors since those lesions which can be recognized at a glance are often no longer amenable to satisfactory treatment. Further, the evaluation of the clinical features of a malignant lesion often bear no relationship to its diagnosis since many appear quite innocuous. Biopsy—the removal of a portion of tissue for microscopic examination—can be accomplished in a number of ways, all of which have as their goal the determination of the nature of the process in question.

■ *Methods*

SURGICAL EXCISION—When the lesion is small, and complete removal is to be the method of treatment, whatever the diagnosis, it is better to remove and submit the entire mass for microscopic examination. In the event it is necessary, after diagnosis, the margins of the original excision may be extended. Experience has indicated that this is seldom required and thus removal and biopsy will have been combined.

SURGICAL INCISION—When complete removal is not indicated initially because of size or other factors, a portion of the mass may be removed, care being taken to include adjacent normal tissue. Sufficient quantity of tissue is essential and the

Lieutenant Colonel (Dental Corps), U. S. Army, Dental and Oral Pathology Section, Armed Forces Institute of Pathology, Washington, D. C. Executive Secretary and Pathologist, Registry of Oral Pathology of the American Dental Association.

Captain (Dental Corps), U. S. Army, Resident, Oral Pathology, Armed Forces Institute of Pathology, Washington, D. C.

incision must extend below the deepest extension of the process.

EXPLORATORY BIOPSY—It is often advantageous to combine biopsy with exploration, particularly in lesions of bone or in those arising in deeper areas of soft tissue. In this manner the method and degree of local extension often may be determined. Tissue removed for examination should be representative of the process and not removed from a peripheral or adjacent area where reaction may overshadow the primary lesion.

NEEDLE BIOPSY—Occasionally it is desirable to employ the technic whereby a large lumen needle is inserted into the tumor or lesion to aspirate aggregates of tumor cells. Such a procedure is sometimes used when the tumor is beneath the surface and lying in an accessible position, or in the substance of bone. A lesion frequently approached in this manner is the mixed tumor affecting the major salivary glands. This technic is not recommended for routine use because of the small amount of tissue removed. When the histologic changes are clearly identifiable an accurate diagnosis on such small fragments may be possible; however, this is frequently not the case.

FROZEN SECTION—The technic of rapidly freezing tissue by carbon dioxide for quick diagnosis seems to have little place in the oral regions. Its applicability in other areas of the body, such as the breast, is well known. However, there are few instances where such rapidity is required in the diagnosis of oral tumors. Experience has indicated that frequently, examination of paraffin sections of a tumor previously diagnosed on a frozen section will result in a reversal of the diagnosis.

PUNCH BIOPSY—The utilization of special instruments, such as the punch forceps in the oral regions, is seldom indicated. This instrument was designed to remove tissue from inaccessible areas such as the larynx and should not be used to supplant removal by surgery, particularly when the tumor or lesion may be easily reached. The punch forceps, at best, removes only a small fragment of tissue so that it is often difficult to detect the true nature of the process.

SMEARS—In a sense, smears may be considered a form of biopsy since living material is removed for laboratory examination. When an inflammatory process of a specific nature is suspected, such as syphilis or tuberculosis, smears are of value. In such instances, material from the active portion of the process should be taken since it is in these areas that the organisms flourish. Smears may be combined with biopsy when the possibility of a neoplastic process exists.

EXFOLIATIVE CYTOLOGY—The application of the Papanicolaou technic to the oral regions has not been clearly shown. By this method superficial cells are removed by smear technic to evaluate cytological changes to determine early malignant change.

■ *Dangers and Contradictions for Biopsy*

Biopsy has sometimes been neglected because of the fear that the procedure may

disturb a quiescent tumor or result in the spread of a malignant lesion. This, of course, is a theoretical possibility; however, practical experience has shown that it seldom occurs. Further, this remote possibility may be largely overcome by planning the procedure so that surgery follows immediately, or by previous irradiation of the tumor. The greatest care and planning should be exercised in sarcomatous lesions, since they are usually highly vascular and most often metastasize by way of the blood stream. It is obvious that any procedure which may injure or open the blood channels in such a tumor may increase the possibility of spread of the tumor cells. This is particularly true of the melanoma, a highly vascular, malignant tumor which metastasizes early and widely, often from a small, well concealed primary lesion. The melanoma should never be subjected to biopsy but should be removed in its entirety.

For obvious reasons a well encapsulated tumor should be removed completely rather than being subjected to biopsy since perforation of the capsule may interject some element of danger. Lesions which are in extremely inaccessible places should not be approached twice; once for biopsy and again for surgical removal. Location is of great importance since a relatively benign tumor growing in an inaccessible area and adjacent to vulnerable and vital structures may offer a more serious prognosis than a more highly malignant lesion in an accessible position.

Liljencrantz, quoted by Kilduff,[1] has summarized the dangers of biopsy in relation to its diagnostic importance in these statements: "Whatever the theoretical dangers of biopsy may be, the dangers of attempting radical treatment or of abandoning a patient to a hopeless prognosis without tissue proof are far more serious . . ." and "Properly performed biopsy is less dangerous than is rough handling or massage by a patient or physician."

The question of the reliability of the biopsy in determining malignancy is often raised. Since there is an important human element involved it is obvious that the ability of the pathologist is of paramount importance. When there is obvious malignant change this is negligible; however, when a critical evaluation is necessary, it becomes of unquestioned importance. With the present standards and training in oral pathology, it is appropriate to suggest that the diagnosis of oral tumors and oral lesions is perhaps best accomplished by an oral pathologist. It is recognized that their number is far too small to adequately represent dentistry; however, this is rapidly being overcome and in the years to come there is reason to believe that a well-trained oral pathologist will be available, at least in a consulting capacity, in all dental schools and in most hospitals. The Registry of Oral Pathology of the American Dental Association is attempting to ease the present situation by offering consultation to all pathologists, who desire its services.

■ *Indications for Biopsy*

Suspicion as to the presence of malignancy is justified whenever an indolent lesion is slow in healing, particularly if it is present in areas frequently subjected

1. Kilduff, R. A., Biopsy in the Diagnosis of Malignancy. *J. Med. Soc. Cape May County, New Jersey* 4:32, 1942.

to malignant tumors such as the tongue and lips. It may be safely said that a rational suspicion is far better than a careless optimism which denies or ignores the suspicion until it is too late. It is important to remember that biopsy is only one of the steps in arriving at a correct diagnosis and should never be relied upon to the exclusion of careful and thorough clinical examination.

Although biopsy is essentially a diagnostic procedure, the indications for which are well established, it may also be used for other purposes. For example, it is often of value in determining the degree of malignancy even after the diagnosis has been established. Further, the pathologist is frequently able to estimate the degree of radiosensitivity and thus be of assistance in formulating therapy. In certain instances an estimation of the degree of local invasion can be ascertained through biopsy since locally aggressive tumors may exhibit certain features such as excessive cellularity which may provide valuable information as to the dependable protection of a capsule. Indiscriminate biopsy is never indicated. Valuable as the procedure is, it should never be decided upon without a careful consideration of all the factors involved and an appreciation for its limitations and possible dangers. The final decision should always be governed by sound clinical judgement and experience.

Although sufficient tissue must be removed to permit orientation of the specimen, it is obvious that quality is of more importance than quantity. If the specimen is not delivered to the pathologist in the best possible condition, the accuracy of the diagnosis will, in most instances, suffer. When an unequivocal diagnosis of malignancy is made, it can usually be accepted as final. When, however, the report is negative, it may not be conclusive. When there is strong clinical evidence of malignancy and the biopsy report is negative, it is wise for the clinician and the pathologist to examine the patient together to determine future sites from which tissue will be removed.

■ *Fixation*

Proper fixation of the tissue after removal is of utmost importance. The specimen should be washed in cold tap water to remove excessive blood, and immediately be transferred to the fixative even before the wound is sutured or otherwise dressed. Tissue which is permitted to lie unprotected in the open air will undergo autolysis almost immediately. Such changes may seriously interfere with the accuracy of the histologic diagnosis.

For routine fixation, 10 per cent Formalin (4 per cent formaldehyde) is the solution of choice. Certain writers have suggested that alcohol may be used, their explanation being that most dentists have alcohol readily available. Their reasoning is that a biopsy specimen fixed in alcohol is better than none at all. This is unsound since tissue inadequately or improperly fixed may result in an erroneous diagnosis. Further, since it is universally agreed that for proper routine fixation (for special stains other solutions may be preferred) 10 per cent Formalin is the fixative of choice it is only necessary for the clinician to provide himself with the correct solution in specimen bottles so that it will be available when needed. Formalin is stable but should not be allowed to stand

for long periods of time since it may become too acid for satisfactory use. Specimen bottles should have a mouth sufficiently large to permit insertion of the tissue without squeezing or otherwise distorting. Sufficient Formalin should be used to completely cover the tissue. When the specimen is of average size, Formalin equal to twenty times the volume of the tissue is recommended.

■ *Biopsy Technic*

Although size, position and other factors make it impossible to standardize the technic for biopsy it is true that certain fundamental points must be kept in mind at all times. A large percentage of oral lesions are located on superficial exposed surfaces and it is, therefore, appropriate to select such a lesion in explaining the steps to be followed. Figure 1 shows a leukoplakic patch on the inner surface of the cheek with well delineated borders which would obviously require histologic examination in establishing a diagnosis. These steps should be followed in order:

SURFACE ANTISEPTIC—It should be borne in mind that antiseptics which are deeply colored—such as Merthiolate and iodine—may interfere with the subsequent staining of the tissue specimen. It is therefore recommended that 70 per cent alcohol be employed for this purpose. (See Figure 2, *A*.)

ANESTHESIA—An anesthetic such as procaine is recommended rather than ethyl chloride or other solutions which produce anesthesia by freezing. These latter solutions may cause serious cell deterioration, thus increasing the possibility of an inaccurate diagnosis. Injection of

Fig. 1.—Leukoplakic patch on the inner surface of the cheek with well delineated borders which would obviously require histologic examination in establishing a diagnosis

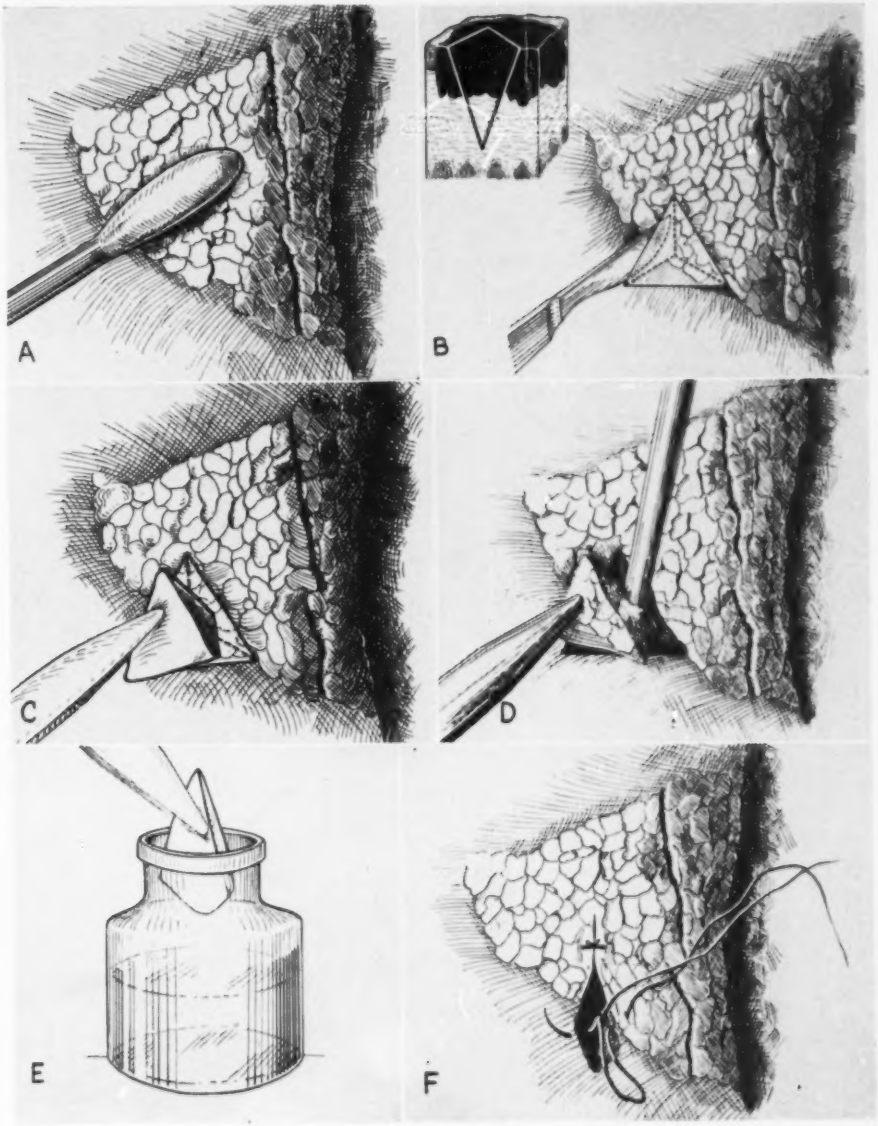


Fig. 2.–Drawings showing steps in biopsy technic

the procaine should be at the edge of the lesion and not into the lesion proper. This is also to prevent undue tissue distortion.

INCISION—The incisions should be made at the edge of the lesion (Fig. 2, *B*) care being taken to include normal tissue and to extend the incisions below the deepest extension of the process. A triangular section is desirable since it reduces the number of incisions. The scalpel should be angled toward an imaginary point beneath the base of the lesion.

REMOVAL—The triangular wedge is grasped with tissue forceps having neither serrations nor "teeth." This is to avoid tearing or otherwise distorting the tissue (Fig. 2, *C*). The specimen may be freed at its base by blunt dissection or by snipping with small pointed shears (Fig. 2, *D*).

FIXATION—The specimen is immediately placed in 10 per cent Formalin in a wide-mouthed bottle. The bottle should be large enough to contain fixative solution equal to approximately twenty times the volume of the tissue. It is desirable that the tissue be washed in cold tap water to remove excess blood before being placed in the specimen bottle (Fig. 2, *E*).

SUTURING—The resulting wound is then cared for as indicated. If the sample removed is sizable it may be necessary to place sutures either in the neighboring normal tissue or in the lesion itself (Fig. 2, *F*).

SUBSEQUENT CARE OF SPECIMEN—From 48 to 72 hours is usually a sufficient period of time to insure adequate fixation. This, of course, will depend upon the size of the specimen. The specimen bottle, together with the clinical history and roentgenograms, should be forwarded to the pathologist.

■ *Summary*

Submit accurate and complete clinical history with the specimen.

Remove sufficient tissue to insure having representative material.

Submit roentgenograms to the pathologist if they are of value in the diagnosis.

Take periodic biopsies to follow the course of a lesion or to check for recurrence.

Use sufficient volume of fixative.

Use frozen section technic *but only when absolutely necessary.*

Don't biopsy a small lesion—remove it entirely.

Don't use cautery—heat destroys tissue detail.

Don't take specimen from active necrotic area unless bacterial stains are desired.

Don't allow tissue to dry out before fixation.

Don't always depend upon a single biopsy—several from different areas may be necessary.

Be quick to suspect cancer but slow to diagnose it. Corroborate the diagnosis by all available means.

■ Function of a Sclerosing Agent

Q.—In the January 1950 issue of the Journal of Oral Surgery, in reply to the question on treatment of ameloblastomas, you suggested that the cavity be treated with a sclerosing agent. What is the particular function of such an agent and what sclerosing agent is used?—*James Passalis, Winnipeg.*

A.—A sclerosing agent, suggested as an adjunct to follow complete enucleation, is employed to necrotize by fixation any possible residual neoplastic cells around the peripheral irregularities of the operative defect. The common recurrence or persistence of ameloblastomas is notorious and every possible effort must be made to eradicate the tumor at the first surgical intervention. Several protoplasm fixing agents have been used for this purpose including phenol, picric acid and tincture of iodine. Delayed bone healing can be expected from the use of these agents, but the elimination of the ameloblastoma is the prime consideration. When dealing with benign entities such as the common radicular or dentigerous cyst there would be no indication for the use of a sclerosing agent.

■ Regeneration of Bone in Cystic Cavities

Q.—What success has been attained with the use of bone pastes and inorganic salts in hastening the regeneration of bone in cystic cavities of the jaws?—*James Passalis, Winnipeg.*

A.—In the July 1948 issue of the Journal of Oral Surgery, Schram and Fosdick of Chicago reported the stimulation of healing in long bones of experimental animals with the use of bone mineral salts in resected defects. The conditions of their work permitted complete coverage and closure of the implant areas. Further research has been carried out on this study. However, in the management of cysts of the jaws it is usually impossible to obtain these conditions and a foreign material in healing bone cavities in the jaws predisposed to contamination by oral flora has led to complications of delayed healing.

■ Bone Destruction Extending Below Incision

Q.—In root resection procedures it is disturbing at times to find an area of bone destruction extending below the incision and making closure troublesome. How may this difficulty be avoided?—*J. W., Atlanta.*

A.—The roentgenographic impression of periapical pathology usually minimizes the bone defect. For proper healing we all recognize that a flap margin must be supported by sound bone. Incisions which are made over a bone defect such as a cystic cavity will involve healing complications. Whenever relatively large or low areas are encountered in resection procedures, a free gingival margin incision around the involved and adjacent teeth with lateral oblique incisions will give good access and avoid this closure problem.

■ Exposure of Nasopalatine Canal

Q.—What consideration should be given to the opening of the nasopalatine canal when reflecting flaps for removing palatally impacted cuspids?

A.—Standard procedure for flap exposure of the anterior palate employs a free gingival margin incision which crosses the midline to varying degrees around the arch. When the flap is re-

flected the structures from the nasopalatine canal are severed without hazard. The nerves and vessels are terminal at this point and are of little practical significance.

■ Selection of Antibiotics in Treating Infections

Q.—What are the factors which determine the choice of antibiotic in problems of infection?

A.—The sensitivity of the microorganism to the chemotherapeutic agent is the prime consideration. Laboratory determinations on cultures from the infection will supplement established knowledge of sensitivity ranges for the particular antibiotic employed. Other factors of toxicity, acquired resistance or fastness during therapy and mixed secondary infections will influence the selection of antibiotics in the management of infection problems.

■ Treatment of Vincent's Infection

Q.—Does the specialty of oral surgery include the treatment of Vincent's infection?—*Benjamin Tucker, D.D.S., Babylon, New York.*

A.—Vincent's infection is a gingival disease and is, therefore, in the field of periodontia.

The treatment of Vincent's infection consists of three phases:

1. The relief of acute symptoms by establishing good oral hygiene and the use of drugs when necessary.
2. The healing of the areas of ulceration and regeneration of the destroyed tissue.
3. The prevention of exacerbations of the acute process.

The second and third phases necessitate thorough prophylaxis and the teaching of methods of good oral hygiene. It may also require the placement of restorations and the relief of traumatic occlusion.

The oral surgeon, when treating Vincent's infection, will prescribe penicillin or some other therapeutic agent which may relieve the acute symptoms but will not carry out the other procedures which are essential in providing a cure. The patient will still have to seek the assistance of a general dentist or periodontist. If he does so immediately following his visit to the oral surgeon, when he is free of acute symptoms, it becomes difficult to convince him of the need of further treatment. The use of penicillin and other drugs may relieve the acute phase of the disease only to have it recur in a subacute or chronic phase. The long-standing subacute or chronic Vincent's infection results in tissue destruction and the patient at some later date experiences a severe periodontal problem.

Because the oral surgeon treats only the acute symptoms and does not eliminate the cause or prevent recurrence, it would be reasonable to conclude that the treatment of Vincent's infection is not in the province of oral surgery.—*Donald A. Kerr.*

It is well known that most oral surgeons treat acute Vincent's infection. This is a matter of necessity in many communities but follow up care by the patient's general dentist or periodontist is highly desirable to avoid subacute or chronic disease.—Editor.

■ Exfoliating Granulation Tissue

Q.—On several occasions, after rather difficult extractions, patients have developed areas of persistent exfoliating granulation tissue at a flap margin or socket. To what can this complication be attributed?

A.—Pyogenic granulation tissue from such a recent operative site is invariably a reaction to a foreign body. Commonly there is a bone fragment which may be found sequestrating beneath the soft tissue in these processes. Exploration, under anesthesia, for this cause is indicated to restore normal healing processes.

■ INDEX TO DENTAL LITERATURE, in the English Language. (Jan.-June, 1950.) 91 pages. Supplement. Price $30 annual subscription. Chicago: American Dental Association, 1950.

The second quarterly cumulation of the *Index to Dental Literature* for 1950 has just been released by the Bureau of Library and Indexing Service of the American Dental Association. This classified subject and author index, covering dental periodicals printed in the English language, includes over 140 publications from the United States, the British Commonwealth, India and most recently Sweden.

As in the previously published volumes of the *Index*, articles are classified according to an established list of subject headings, with cross-referencing to facilitate usage. Approximately 4,000 references appear in this issue, which covers January through June of the current year.

Promptness of coverage of this new style of *Index* may be judged by appearance of articles from a majority of journals which have a June publication date. Many periodicals which were received too late for inclusion in the first quarter publication are now listed.

A supplement of material which appeared late in 1949 is carried in a special section. There is also a list of journals covered.

A cumulation of the four quarters of 1950 will be available in a bound volume similar to previously published *Indexes.*—*Martha Ann Mann.*

■ A TEXTBOOK OF DENTAL ANATOMY AND PHYSIOLOGY. Russell C. Wheeler. Second edition, 422 pages, with 414 illustrations. Index. Price $6.75. Philadelphia: W. B. Saunders, 1950.

The authors have produced a worthy contribution correlating form and function in their study of tooth design. They stress the importance of form, alignment and occlusion as a background for the phases of dental practice. The material covers the macroscopic or gross anatomy of the individual teeth, their anatomy on cross section, the alignment of the teeth in the jaws, their occlusion during the various jaw relations and the significance of the foregoing during function. Considerable space has been allotted to the bony foundations of the teeth, important maxillary and mandibular landmarks and the temporomandibular articulation. A brief outline of the blood and nerve supply to the teeth has been added for reference purposes in order to complete the text. The book is a stimulating contribution to elementary students and serves as an excellent review of the physiological basis of dental practice.—*I. Newton Kugelmass.*

■ INTERNAL MEDICINE IN DENTAL PRACTICE. Bernard I. Comroe, Leon H. Collins, Jr., and Martin P. Crane. Third edition, revised. 81 illustrations and 6 color plates. 536 pages, with index. Price $6.50. Philadelphia: Lea and Febiger, 1949.

The authors in this third edition of *Internal Medicine in Dental Practice* have brought to the dental student and to the practicing dentist a clear description of the medicodental problems now considered essential knowledge for the progressive dental practitioner. Dentistry, as a health service, must of necessity be closely associated with that of medicine, and the physician in turn should understand many of the problems of dental practice in order that he may with wisdom guide those who consult him.

Chapter 1, dealing with diseases of the heart and blood vessels, is well written and gives a clear understanding of what occurs when these organs are diseased. The second part of this chapter, dealing with cardiovascular disease

in relation to dentistry, is a most practical guide to the dentist.

Both local and general anesthesia are part of dental practice, and the authors rightfully point to the danger of hypertension as a cause of sudden death. This part of the chapter should be of particular interest to the dentist who might with wisdom seek medical consultation in such cases before proceeding to administer either local or general anesthesia. The modern dentist should consider the use of a sphygmomanometer as a necessary instrument in evaluating anesthetic risks.

The chapter on diseases of the heart also points out the risks attending dental extractions in patients suffering from rheumatic heart disease and explains prophylactic measures to be followed in the care of these patients.

The chapter dealing with diseases of the respiratory tract is of interest to dentists, from the standpoint of the dentist protecting himself, as well as protecting his patient. With the advent of the air abrasive technic for cavity preparation, dentists must recognize that inhalation of the material used may result in pulmonary lesions.

Chapter 7, "Diseases of the Blood and Blood-Forming Organs," is of particular interest to the dentist. The text on anemia and leukemia is excellent.

Chapter 9 has much of interest to the dentist in the description of allergic disturbances, deficiency diseases and vitamins. These are problems frequently encountered in practice.

The dentist should find the chapter on foci of infection extremely instructive, especially that part covering bacteremia following dental extractions.

Chapters 14 and 15, concerned with the sulfonamides and antibiotics, will give the practicing dentist a real working knowledge of drugs commonly used in dentistry and often poorly understood.

The book as a whole is an excellent comprehensive text deserving careful reading and use as a reference work by dentists desiring aid to understand more fully many of the medico-dental problems constantly occurring in everyday dental practice.—*James R. Cameron.*

■ REHABILITATION OF THE HANDICAPPED. A SURVEY OF MEANS AND METHODS. Edited by William H. Soden. Foreword by Sidney Licht. 309 pages, with index of names and index of subjects. Price $5.00. New York: The Ronald Press Company, 1949.

This volume assembles representative accounts of procedures in current use for the mental and physical rehabilitation of persons disabled by illness or injury or otherwise handicapped, with 38 specialists in various fields of the rehabilitation process contributing reports on their recent activities in a common effort to increase the general understanding of the subject.

The table of contents is divided into five parts: Part I, General Medical and Surgical Techniques; Part II, Neurological Methods; Part III, Psychiatric Developments; Part IV, Vocational and Social Rehabilitation, and Part V, Educational and Psychological Trends.

The subject matter is not of too direct professional interest to dentists as the rehabilitation of handicapped persons calls for the application of the skills of many individuals and groups both within and without the health service professions. However, dental service is often a necessity in the program of the rehabilitation of the individual and in order to take a proper place in the team of rehabilitation personnel, the dentist should acquaint himself with present practices in the whole field of rehabilitation.

Further, the dentist, as a well educated citizen in his community, should take part in the expansion of community interests in the problems of the handicapped. One author in the book estimates that there are 25 million sufferers from chronic ailments, with 50 per cent of the sufferers under 45 years of age; that one million deaths occur yearly from chronic diseases and more than 10 million days of disability each year result from chronic diseases. Not all of this waste can be eliminated through rehabilitation, but the problem is being actively studied and remedies sought from the national down through the state and comm[illegible] levels.

The volume is recommend[illegible]ding for alert and progressive dentists.—[illegible]*am McGill Burns.*

Announcements

■ American Society for the Advancement of General Anesthesia

The fall meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held on Monday evening, October 23, 1950, at the Shelburne Hotel, Lexington Avenue and Thirty-seventh street in New York City.

Max H. Jacobs, M.D., D.M.D., Boston, will present a paper on oral surgery procedures as they are influenced by various anesthetic technics. The dental and medical professions are invited to attend. For further information on this meeting and on society membership, address M. Hillel Feldman, Executive Secretary, 730 Fifth Avenue, New York 19, N. Y.

■ School of Dentistry, University of Pennsylvania, Offers Postgraduate Courses

The School of Dentistry, University of Pennsylvania, is offering 36 postgraduate courses in 23 different subjects during the academic year 1950-1951 including several in the field of oral surgery.

For further information on these courses, address the Director, Postgraduate Courses, School of Dentistry, University of Pennsylvania, 4001 Spruce Street, Philadelphia 4.

■ The American Board of Oral Pathology

The American Board of Oral Pathology will conduct its next examination at Atlantic City, New Jersey, in conjunction with the 1950 meeting of the American Dental Association, October 30 to November 2, 1950. The examination will be both practical and oral. Individuals who contemplate appearing before the board should make arrangements to submit their credentials as soon as possible.

Prospective candidates may secure detailed information by addressing the secretary, Lt. Colonel Joseph L. Bernier, D. C., Armed Forces Institute of Pathology, Seventh Street and Independence Avenue, S.W., Washington 25, D. C.

■ Federal Security Administration Grants

The Federal Security Administration recently allotted grants totalling $63,768 to dental schools for support and improvement of cancer instruction. Now all but three of the nation's forty-one dental schools receive such grants.

■ Postgraduate Courses in Dentistry at Ohio State University

The Ohio State University College of Dentistry announces the schedule for its postgraduate courses in dentistry to be presented during the fall of 1950.

Each course is given for five consecutive days, Monday through Friday, and the fee for each is $50, except for oral surgery which is $100. All of the courses have been approved by the Veterans Administration. The classes are limited to ten men each so that there is opportunity for discussion and personalized instruction.

Further information and applications may be secured from the Postgraduate Division of the College of Dentistry, Ohio State University, Columbus 10, Ohio.

■ Graduate and Postgraduate Studies at Tufts College Dental School

The Division of Graduate and Postgraduate Studies at Tufts College Dental School has announced its complete schedule of thirty-eight refresher courses to be given during the academic year October 1950 through June 1951. These courses will cover all fields of dentistry and are given on a one day per week basis and on a continuous day basis.

For information regarding these courses, address correspondence to Dr. Arthur H. Wuehrmann, Division of Graduate and Postgraduate Studies, Tufts College Dental School, 136 Harrison Avenue, Boston 11.

■ Ninety-first Annual Session of the American Dental Association

The ninety-first annual session of the American Dental Association will be held in Atlantic City, New Jersey, October 30 to November 2, 1950.

The general meeting will be held at 8:00 P.M., Tuesday, October 31, in the American Room of the Hotel Traymore.

■ Twelfth Congres Francais de Stomatologie

The twelfth French Congress of Stomatology will be held in Paris, during the first two weeks of October, 1951. The executive board consists of: president, Dr. Rene Vincent; vice-presidents, Dr. Vilenski and Dr. Carvallo; general secretary, Dr. P. Friez; treasurer, Medecin-General Ginestet.

Those planning to attend the Congress and particularly those wishing to contribute to the scientific program are requested to notify the general secretary as early as possible.

Address correspondence to Dr. P. Friez, 42 rue Notre-Dame de Champs, Paris 6, France.

■ American Dental Directory, Second Edition, Soon to be Published

The second edition of the *American Dental Directory*, containing the names and addresses of approximately 80,000 licensed members of the dental profession in the United States and its possessions, will be published by the American Dental Association in November 1950.

This second edition will also include other information of value to every member of the profession such as reciprocity arrangements, distribution of dentists, lists of state and district societies, dental schools, dental publications and requirements for licensure in the various states.

The *Directory* will sell for $12.50. A special discount of 20 per cent will be allowed on all orders placed prior to November 1. Those wishing to take advantage of the discount should remit $10 for the *Directory* to the American Dental Association, Order Department, 222 East Superior Street, Chicago 11, before the publication date.

■ Mexican Association of Stomatologists Organized

The Mexican Association of Stomatologists was recently organized in Mexico City. This association is composed of doctors holding D.D.S. and M.D. degrees. The aims of the society are to promote progress of the science of stomatology; to encourage research in this field; to disseminate information in regard to the field of stomatology to the medical profession, and to foster a closer relationship between the health sciences of dentistry and medicine.

The association elected Dr. Yury Kuttler, president; Dr. Fausto Cisneros, secretary; and Dr. Diego Munoz L., treasurer.

Index to Journal of Oral Surgery

1950

A

ABERRANT TEETH: See Teeth—impacted
ACRYLIC RESINS
See also Obturators and similar appliances—acrylic resin
ALLERGY
DILANTIN SODIUM
Reader, Z. A. Gingival hyperplasia resulting from diphenylhydantoin sodium: a review of the literature. 25
MORPHINE
Salter, W. T. and White, Mary Louise. Morphine "sensitivity." 268 Abstract
AMELOBLASTOMA
Bernier, J. L. and Tiecke, R. W. Adeno-ameloblastoma. 259
Pell, G. J. Ameloblastoma of the mandible: report of case. 155
Treatment for ameloblastomas. 73
AMERICAN ASSOCIATION FOR CLEFT PALATE REHABILITATION
Meeting. 181
AMERICAN ASSOCIATION OF INDUSTRIAL DENTISTS
Annual convention. 182
AMERICAN BOARD OF ORAL PATHOLOGY
Announcements. 181; 272; 353
AMERICAN BOARD OF ORAL SURGERY
Announcements. 181
AMERICAN DENTAL ASSOCIATION
COUNCIL ON RELIEF
Relief Fund. 181
AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA
Meetings. 271; 353
AMERICAN SOCIETY OF MAXILLOFACIAL SURGEONS
Maxillofacial surgeons to meet in New York City. 272
AMERICAN SOCIETY OF ORAL SURGEONS
Announcements. 182
AMYLOIDOSIS
Meyer, Irving. Value of gingival biopsy in the diagnosis of generalized amyloidosis. 314
ANESTHESIA
Angina pectoris complication. 73
ACCIDENTS DURING
England, L. C. Respiratory and cardiac stimulants and resuscitation. 203
ANESTHESIA AND ANESTHETICS, general
General anesthetic. 75
PENTOTHAL SODIUM: See Anesthesia and anesthetics, general—thiopental sodium
THIOPENTAL SODIUM
Hershey, S. G. and Rovenstine, E. A. Anesthetic management of patients with fracture of the mandible. 82 Abstract
Thompson, E. C. and Sleeper, H. R. General anesthetic methods with special reference to thiopental sodium. 121
ANESTHESIA AND ANESTHETICS, local
Sudden blanching of the cheek. 174
BLOCK
Anesthesia of the maxillary molars. 262
Szerlip, Leonard. Roentgenographic study of the pterygopalatine injection for blocking the maxillary nerve. 327
INFILTRATION
Anesthesia of the maxillary central incisors. 174
LIDOCAINE HYDROCHLORIDE
Lozier, Matthew. Evaluation of xylocaine as a new local anesthetic. 266 Abstract
NOVOCAIN: See procaine hydrochloride listed immediately below
PROCAINE HYDROCHLORIDE
Charter, W. V. et al. Study of novocain (procaine) sensitivity among Navy dental officers. 85
ANKYLOSIS
Smith, J. B. Temporomandibular ankylosis. 297
Straith, C. L. and Lewis, J. R. Ankylosis of the temporomandibular joint. 87
ANOMALIES
Fontaine, Sadi B. Congenital anomalies of the floor of the mouth and of the mandible: report of two cases. 331
ANOXEMIA: See Anesthesia—accidents during
ANTIBIOTICS
See also Penicillin
Egan, G. F. Osteomyelitis of the mandible treated with aureomycin: report of case. 60
Flippin, H. F. and Boger, W. P. Recent advances in antibiotic and sulfonamide therapy. 83 Abstract
Selection of antibiotics in treating infections. 350
VINCENT'S INFECTION: See Vincent's infection
ANTRUM: See Maxillary sinus
APFEL, HARLAND. Autoplasty of enucleated prefunctional third molars. 289
ASPHYXIA
DURING ANESTHESIA: See Anesthesia—accidents during
ATKINSON, S. R. Third molar problem. 136
ATOMIC ENERGY
Pearse, H. E. and Payne, J. T. Burns resulting from atomic bomb explosion. 250 Abstract
AUREOMYCIN: See Antibiotics
AUTOPLASTY
Apfel, Harland. Autoplasty of enucleated prefunctional third molars. 289

B

BAMES, H. O. Plastic surgical correction of oral deformities. 143
BARBERIO, J. R. AND LeVEEN, H. H. Tissue reaction to plastics. 62 Abstract
BAUMGARTNER, C. J. Differential diagnosis of tumors of the neck. 50
BEAR, HARRY. Obituary. 340 portrait
BEDER, O. E. Surgical and maxillofacial prosthesis. (Book rev.) 176
BEELER, J. W., et al. New drug in the treatment of radiation sickness. 180 Abstract
BERGER, ADOLPH. Mixed tumors of the palate. 208
BERKSHIRE CONFERENCE IN PERIODONTOLOGY AND ORAL PATHOLOGY (First)
Announcements. 181
BERNIER, J. L. AND TIECKE, R. W. Adeno-ameloblastoma. 259
Biopsy. 342
Fibrous dysplasia. 256
Hemangioma of the lip. 67
Hemangioma of the parotid gland. 171
Incisive canal cyst. 254
Mixed tumor of the parotid gland. 167
Nevus of the gingiva. 165
Plasmocytoma. 70
Squamous cell carcinoma involving the periodontal membrane. 65
BENIGN TUMORS: See Tumors
BIOPSY
Bernier, J. L. and Tiecke, R. W. Biopsy. 342
Martin, Hayes. Biopsy. 72 Abstract
Meyer, Irving. Value of gingival biopsy in the diagnosis of generalized amyloidosis. 314
BLOCK ANESTHESIA: See Anesthesia and anesthetics, local—block
BLOCKER, T. G. AND STOUT, R. A. Mandibular reconstruction, World War II. 86

BLOOD
COAGULATION: See also Hemorrhage—control
Dreskin, O. H. and Rosenthal, Nathan. Hemophilia-like disease with prolonged coagulation time and a circulating anticoagulant; report of a case in a female. 270 Abstract
DISEASES: See also specific diseases, i.e. Lukemia, etc.
Davidson, C. H. Rutin used in the oral surgery of a patient with hereditary hemorrhagic telangiectasis. 12
BOGER, W. P. AND FLIPPIN, H. F. Recent advances in antibiotic and sulfonamide therapy. 83 Abstract
BONE
BANK
Lipscomb, P. R. Bone bank. (Ed.) 81 Abstract
DISEASES: See Necrosis; Osteomyelitis; Osteoma; Osteitis—deformans
Bernier, J. L. and Tiecke, R. W. Fibrous dysplasia. 256
Bone destruction extending below incision. 349
GRAFTING
Macomber, W. B., et al. Mandibular bone grafts. 178 Abstract
Straith, Claire L. Mortised mandibular bone graft following giant cell tumor removal. 269 Abstract
REGENERATION
Regeneration of bone in cystic cavities. 349
BOOK REVIEWS
American Dental Association. Index to Dental Literature. 351
Beder, O. E. Surgical and maxillofacial prosthesis. 176
Comroe, B. I., et al. Internal medicine in dental practice. 351
Corlette, C. E. Surgeon's guide to local anesthesia—a manual of shockless surgery. 264
Excerpta medica. 76
Kazanjian, V. H. and Converse, J. M. Surgical treatment of facial injuries. 176
Martin, Hayes. Cancer of the head and neck. 265
Moon, G. R. How to become a doctor. 177
Pepper, O. H. P. Medical etymology. 77
Seltzer, A. P. Plastic surgery of the nose. 79
Sicher, Harry. Oral anatomy. 76
Soden, W. H. (Edited by.) Rehabilitation of the handicapped. A survey of means and methods. 352
Strean, L. P. Oral bacterial infection. 78
Terapeutica antibiotica con tirotricina. (Antibiotic therapeutics with tyrothricin.) 264
Truex, R. C. and Kellner, C. E. Detailed atlas of the head and neck. 80
Wheeler, R. C. Textbook of dental anatomy and physiology. 351
Wolff, H. G. and Wolf, Stewart. Pain. 76
BRANDON, S. A. Osteoma of the mandible: report of case. 153
BROWN, C. J., JR. Osteomyelitis in fatal lymphatic leukemia: report of case. 245
BROWN, W. H. AND SHACKELFORD, R. R. Restricted jaw motion due to osteochondroma of the coronoid process. 86 Abstract
BROWNSON, H. N. Appointed professor of Oral Surgery and head of the Surgery Department at the University of Southern California. 89
BUNNELL, STERLING. Teamwork in surgery. 37 Abstract
BURNS
THERAPY
Pearse, H. E. and Payne, J. T. Burns resulting from atomic bomb explosion. 250 Abstract
BURNS, W. M. (Reviewed by.) Rehabilitation of the handicapped. A survey of means and methods. W. H. Soden. 352

C

CAMERON, J. R. Appointed to staff of Graduate School of Medicine, University of Pennsylvania. 90
(Reviewed by.) Internal medicine in dental practice. B. I. Comroe, et al. 351
CANCER
CONTROL
Martin, Hayes. Early diagnosis of cancer of prime importance. 15 Abstract
METASTASIS
Metastatic lesions of the mandible. 73
ORAL: See also Tumors
Bernier, J. L. and Tiecke, R. W. Squamous cell carcinoma involving the periodontal membrane. 65
Cross, J. E. et al. Carcinoma of the lip. 83 Abstract
Doane, H. F. Radiologic management of malignant oral lesions. 133
Sharp, G. S. and Wood, R. C. Treatment of cancer of the gums. 185
Sharp, G. S., et al. Irradiation as the preferred treatment of cancer of the lip. 270 Abstract
CARCINOMA: See Cancer—oral; See also Tumors
CARDIAC DISEASE: See Heart disease
CHARTER, W. V. et al. Study of novocain (procaine) sensitivity among Navy dental officers. 85
CHEMOTHERAPY: See Antibiotics; See also Penicillin; Sulfonamides
CHRISTENSEN, R. O. Extraoral removal of an impacted lower third molar; report of a case. 335
CLEFT LIP: See Cleft palate and harelip
CLEFT PALATE AND HARELIP
SURGICAL TREATMENT
Huffman, W. C. and Lierle, D. M. Repair of the bilateral cleft lip. 267 Abstract
CLEIDOCRANIAL DYSOSTOSIS: See Systemic conditions manifested in mouth—cleidocranial dysostosis
COLD THERAPY: See Heat and cold therapy
COMROE, B. I., et al. Internal medicine in dental practice. (Book rev.) 351
CONDYLE: See Temporomandibular joint—diseases
CONGRES FRANCAIS DE STOMATOLOGIE
French Congress of Stomatology. 354
CONVERSE, J. M. AND KAZANJIAN, V. H. Surgical treatment of facial injuries. (Book rev.) 176
COOLEY, DeO. (Abstracted by.) Anesthetic management of patients with fracture of the mandible. S. G. Hershey and E. A. Rovenstine. 82
Cysts of the nasal vestibule. Fernand Montreuil. 84
CORLETTE, C. E. Surgeon's guide to local anesthesia—a manual of shockless surgery. (Book rev.) 264
CRICH, W. A. Aberrant maxillary cuspid with complications: report of case. 157
CRIKELAIR, G. F. AND GRANT, RONALD. Maxillary facial fistula. 285
CROSS, J. E. et al. Carcinoma of the lip. 83 Abstract
CUSPIDS: See Teeth—cuspids
CYSTS
See also Ameloblastoma
Bernier, J. L. and Tiecke, R. W. Incisive canal cyst. 254
Dentigerous cyst: follicular cyst. 75
Montreuil, Fernand. Cysts of the nasal vestibule. 84 Abstract

D

DAVIDSON, C. H. Rutin used in the oral surgery of a patient with hereditary hemorrhagic telangiectasis. 12
DENTURES
TISSUE CHANGES UNDER
Treatment for hyperplastic tissue. 262
DEWEY, A. R. Acute lymphatic leukemia with a fatal termination: report of case. 57
DIABETES AND DENTISTRY
Precautions for the diabetic patient. 262
DIATHERMY AND SURGICAL DIATHERMY IN DENTISTRY
General anesthetic. 75
DIET AND NUTRITION
ORAL SURGERY
Problem of nutrition in oral surgery. (Ed.) 339
DILANTIN SODIUM
See Allergy—dilantin sodium
DINGMAN, R. O. Practice of oral surgery. (Ed.) 63
Will oral surgery meet the challenge? (Ed.) 162

DIRECTORIES
American Dental Directory, second edition, soon to be published. 354
DISLOCATION OF MANDIBLE
McKelvey, L. E. Sclerosing solution in the treatment of chronic subluxation of the temporomandibular joint. 225
DOANE, H. F. Radiologic management of malignant oral lesions. 133
DRESKIN, O. H. AND ROSENTHAL, NATHAN. Hemophilia-like disease with prolonged coagulation time and a circulating anticoagulant; report of a case in a female. 270 Abstract
DRUGS
Salter, W. T. and White, Mary Louise. Morphine "sensitivity." 268 Abstract

E

ECCHYMOSIS: See Extraction—infection following
EDUCATION, dental
Appointments to the University of Southern California School of Dentistry. 89
J. R. Cameron appointed to staff of Graduate School of Medicine, University of Pennsylvania. 90
Roy A. Stout appointed to staff of University of Texas. 89
FELLOWSHIPS: See Fellowships
INTERNSHIPS: See Internships, dental
ORAL SURGERY
Courses in Oral Surgery at the University of Michigan. 91
One week course in minor oral surgery. (University of Toronto.) 182
ORTHODONTICS
Postgraduate course in orthodontics at Ohio State University. 271
POSTGRADUATE
Graduate and postgraduate studies at Tufts College dental school. 354
Postgraduate courses in dentistry. 90
Postgraduate courses in dentistry at Ohio State University. 353
School of Dentistry, University of Pennsylvania, offers postgraduate courses. 272; 353
EGAN, G. F. Osteomyelitis of the mandible treated with aureomycin: report of case. 60
ELECTROSURGERY: See Diathermy and surgical diathermy in dentistry
ENGLAND, L. C. Respiratory and cardiac stimulants and resuscitation. 203
ENDOCRINE GLANDS IN RELATION TO ORAL CONDITIONS
Koch, W. E., Jr. Bone changes associated with hyperparathyroidism, Paget's disease and osteofibroma. 16
EPSTEEN, C. M. Maxillofacial pains simulating trigeminal neuralgia. 114
EXODONTIA: See Extraction
EXTRACTION
IMPACTED TEETH
Christensen, R. O. Extraoral removal of an impacted lower third molar: report of a case. 335
INFECTION FOLLOWING
Ecchymosis as a sequel to minor oral surgery. 262
POSTOPERATIVE COMPLICATIONS AND CARE
Hirschi, R. G. Postextraction healing in vitamin A deficient hamsters. 3

F

FEDERAL SECURITY ADMINISTRATION
Grants. 353
FELLOWSHIPS
Fellowship in Oral Pathology. 272
Oral pathology. (Armed Forces Institute of Pathology.) 182
FIBROUS DYSPLASIA: See Bone—diseases
FIRST PERMANENT MOLARS: See Teeth—molars, first permanent
FISTULA
Grant, Ronald and Crikelair, G. F. Maxillary facial fistula. 285
FLIPPIN, H. F. AND BOGER, W. P. Recent advances in antibiotic and sulfonamide therapy. 83 Abstract
FONTAINE, SADI B. Congenital anomalies of the floor of the mouth and of the mandible: report of two cases. 331
FOREIGN BODIES
IN DENTAL TISSUES
Hagen, T. J. Foreign body in tongue: report of a case. 56
FRACTURES
Moore, F. T. and Ward, T. G. Complications and sequelae of untreated fractures of the facial bones and their management. 178 Abstract
JAWS
Lewis, G. K. Fractured mandible. 95
Matthews, G. W. Fractures of the zygoma and zygomatic arch. 275
Wheelock, R. W. Open reduction of fractured mandible: report of case. 247
FRENCH DENTAL CONGRESS: See Congres Francias de Stomatologie

G

GENERAL ANESTHETICS: See Anesthesia and anesthetics, general
GINGIVA
HYPERTROPHY
Reader, Z. A. Gingival hyperplasia resulting from diphenylhydantoin sodium: a review of the literature. 25
GLANDULAR DISTURBANCES: See Endocrine glands in relation to oral conditions
GRAITCER, D. L. Diamond bone files versus steel bone files. 175
GRANT, RONALD AND CRIKELAIR, G. F. Maxillary facial fistula. 285
GRANULATION TISSUE
Exfoliating granulation tissue. 350
GRINDLAY, J. H. Method of making tubes of polyethylene film for use in anastomosis of the common bile duct, trachea, and pelvic colon. 179 Abstract
GWINN, C. D. Compound composite odontoma: report of case. 337

H

HAGEN, T. J. Foreign body in tongue: report of a case. 56
HARELIP: See Cleft palate and harelip
HATTON, E. H. (Reviewed by.) Oral bacterial infection. L. P. Strean. 78
HEALING OF WOUNDS: See Wounds and injuries —healing
HEART DISEASE
Angina pectoris complication. 73
IN RELATION TO ORAL SURGERY
Patient with angina pectoris. 263
HEART FAILURE DURING ANESTHESIA: See Anesthesia—accidents during
HEAT AND COLD THERAPY
Facial swelling from odontogenic infection. 262
HEMANGIOMA
See also Nevus
Bernier, J. L. and Tiecke, R. W. Hemangioma of the lip. 67
Hemangioma of the parotid gland. 171
HEMORRHAGE
CONTROL
Absorbable hemostatic agents in oral surgery. 74
Dreskin, O. H. and Rosenthal, Nathan. Hemophilia-like disease with prolonged coagulation time and a circulating anticoagulant; report of a case in a female. 270 Abstract
Davidson, C. H. Rutin used in the oral surgery of a patient with hereditary hemorrhagic telangiectasis. 12
HERSHEY, S. G. AND ROVENSTINE, E. A. Anesthetic management of patients with fracture of the mandible. 82 Abstract
HIRD, A. J. Mikulicz's syndrome. 270 Abstract
HIRSCHI, R. G. Postextraction healing in vitamin A deficient hamsters. 3
HOSPITAL INTERNSHIPS FOR DENTISTS: See Internships, dental

HUFFMAN, W. C. AND LIERLE, D. M. Repair of the bilateral cleft lip. 267 Abstract
HYPERPARATHYROIDISM: See Endocrine glands in relation to oral conditions
HYPERTROPHY OF GUM: See Gingiva—hypertrophy

I

IMPACTED TEETH: See Teeth—impacted; See also Extraction—impacted teeth
IMPLANTATION: See Autoplasty
INFECTION
FOLLOWING EXTRACTION OF TEETH: See Extraction—infection following
VINCENT'S: See Vincent's infection
INFILTRATION ANESTHESIA: See Anesthesia and anesthetics, local—infiltration
INJECTION TECHNIC
See also Anesthesia and anesthetics, local and subheadings
Sweet, W. H. Trigeminal injection with radiographic control. 269 Abstract
Szerlip, Leonard. Roentgenographic study of the pterygopalatine injection for blocking the maxillary nerve. 327
INSTRUMENTS AND APPLIANCES: See Oral surgery—instruments
INTERNSHIPS, dental
Coney Island Hospital dental internship. 90
Dental anesthesia residency open at Doctors Hospital, Washington, D. C. 271
Dental internships open at the Jewish Sanitarium Hospital for Chronic Disease. 89
Residency in oral surgery at Louisville General Hospital. 91
Two year internship in oral surgery. (Geisinger Memorial Hospital.) 182

J

JAWS
DISLOCATION: See Dislocation of mandible
FRACTURES: See Fractures—jaws
JOHNSON, O. K. AND SCHAEFER, J. E. (Reviewed by.) Surgeon's guide to local anesthesia—a manual of shockless surgery. C. E. Corlette. 264
JUSTI, W. H. (Abstracted by.) Morphine "sensitivity." W. T. Salter and Mary Louise White. 268 Abstract
Recent advances in antibiotic and sulfonamide therapy. H. F. Flippin and William P. Boger. 83
Restricted jaw motion due to osteochondroma of the coronoid process. R. R. Shackelford and W. H. Brown. 86

K

KAPLAN, I. W. AND McDONALD, R. Penicillin. 173 Abstract
KAZANJIAN, V. H. AND CONVERSE, J. M. Surgical treatment of facial injuries. (Book rev.) 176
KELLNER, C. E. AND TRUEX, R. C. Detailed atlas of the head and neck. (Book rev.) 80
KOCH, W. E., JR. Bone changes associated with hyperparathyroidism, Paget's disease and osteofibroma. 16
KUGELMASS, I. N. (Reviewed by.) Textbook of dental anatomy and physiology. R. C. Wheeler. 351
KROGH, H. W. Dental manifestation of scleroderma: report of case. 242

L

LASKY, A. S. (Abstracted by.) Carcinoma of the lip. J. E. Cross et al. 83
LETTERMAN, G. S. AND MELOY, W. C. Plastic surgery in the United States: a review of the 1948 literature. 266 Abstract
LEO WINTER MEMORIAL MEETING
Scheduled. 90
LEUKEMIA
See also Systemic conditions manifested in mouth—leukemia
Dewey, A. R. Acute lymphatic leukemia with a fatal termination; report of case. 57
LeVEEN, H. H. AND BARBERIO, J. R. Tissue reaction to plastics. 62 Abstract
LEWIS, G. K. Fractured mandible. 95
LEWIS, J. R. AND STRAITH, C. L. Ankylosis of the temporomandibular joint. 87
LIERLE, D. M. AND HUFFMAN, W. C. Repair of the bilateral cleft lip. 267
LIDOCAINE HYDROCHLORIDE: See Anesthesia and anesthetics, local—lidocaine hydrochloride
LIP
CLEFT: See Cleft palate and harelip
LESIONS
Bernier, J. L. and Tiecke, R. W. Hemangioma of the lip. 67
Cross, J. E. et al. Carcinoma of the lip. 83 Abstract
Doane, H. F. Radiologic management of malignant oral lesions. 133
Sharp, G. S. et al. Irradiation as the preferred treatment of cancer of the lip. 270 Abstract
LIPSCOMB, P. R. Bone bank. (Ed.) 81 Abstract
LEUKEMIA: See Systemic conditions manifested in mouth—leukemia
LOCAL ANESTHETICS: See Anesthesia and anesthetics, local
LOZIER, MATTHEW. Evaluation of xylocaine as a new local anesthetic. 266 Abstract
LITERATURE, dental
Oral surgeon's obligation. (Ed.) 251
BOOKS: See Book reviews
LYON, L. Z. Radiation necrosis of the mandible: report of case. 159

M

MACOMBER, W. B. Mandibular bone grafts. 178 Abstract
MAMMEL, C. K. Peripheral and central giant cell tumors of the head region. 38
MALIGNANT TUMORS: See Tumors; See also Cancer
MALOCCLUSION
LOSS OF TEETH AS FACTOR
Apfel, Harland. Autoplasty of enucleated prefunctional third molars. 289
MANDIBLE AND MAXILLA
DISEASES: See also Necrosis; Osteomyelitis
DISLOCATION: See Dislocation of mandible
FRACTURES: See Fractures—jaws
RESECTION
Pincock, D. F. Bilateral osteotomy of the rami for agnathic mandible: report of case. 54
Waldron, C. W. et al. Fundamentals in the surgical treatment of mandibular prognathism. 179 Abstract
Ward, G. E. et al. Use of removable acrylic prosthesis to retain mandibular fragments and adjacent soft tissues in normal position after surgical resection. 267 Abstract
MANN, MARTHA ANN. (Reviewed by.) Index to Dental Literature. 351
Terapeutica antibiotica con tirotricina. (Antibiotic therapeutics with tyrothricin.) 264
MARTIN, HAYES. Biopsy. 72 Abstract
Cancer of the head and neck. (Book rev.) 265
Early diagnosis of cancer of prime importance. 15 Abstract
MATERIA MEDICA AND THERAPEUTICS
See also Antibiotics; Penicillin; Sulfonamides
Beeler, J. W. et al. New drug in the treatment of radiation sickness. 180 Abstract
MATTHEWS, G. W. Fractures of the zygoma and zygomatic arch. 275
MAXILLA: See Mandible and maxilla
MAXILLOFACIAL INJURIES: See Fractures—Jaws
MAXILLARY SINUS
Accidental opening of the maxillary sinus. 174
McDONALD, R. AND KAPLAN, I. W. Penicillin. 173 Abstract
McKELVEY, L. E. (Abstracted by.) Ankylosis of the temporomandibular joint. C. L. Straith and J. R. Lewis. 87

Mandibular bone grafts. W. B. Macomber, et al. 178 Abstract
Repair of the bilateral cleft lip. W. C. Huffman and D. M. Lierle. 267 Abstract
Sclerosing solution in the treatment of chronic subluxation of the temporomandibular joint. 225
MELOY, W. C. AND LETTERMAN, G. S. Plastic surgery in the United States: a review of the 1948 literature. 266
METASTASIS: See Cancer—metastasis
MEXICAN ASSOCIATION OF STOMATOLOGISTS
Mexican Association of Stomatologists organized. 254
MEYER, IRVING. Value of gingival biopsy in the diagnosis of generalized amyloidosis. 314
MICROSCOPY
Registration of microscopes. 49 Abstract
MILLER, H. C. Obituary. 253 Portrait
MOLARS
FIRST PERMANENT: See Teeth—molars, first permanent
THIRD: See Teeth—molars, third; See also Extraction—impacted teeth
MONTREUIL, FERNAND. Cysts of the nasal vestibule. 84 Abstract
MOON, G. R. How to become a doctor. (Book rev.) 177
MOORE, F. T. AND WARD, T. G. Complications and sequelae of untreated fractures of the facial bones and their management. 178 Abstract
MOORMAN, W. C. (Abstracted by.) Fundamentals in the surgical treatment of mandibular prognathism. C. W. Waldron. 179 Abstract
MORPHINE: See Drugs; See also Allergy—morphine

N

NASOPALATINE CANAL
Exposure of nasopalatine canal. 349
NATIONAL INSTITUTE OF DENTAL RESEARCH
New grants for dental research announced. 89
NECROSIS
Lyon, L. Z. Radiation necrosis of the mandible: report of case. 159
NEURALGIA
TRIGEMINAL; TRIFACIAL; TIC DOULOUREUX
Epsteen, C. M. Maxillofacial pains simulating trigeminal neuralgia. 114
Sweet, W. H. Trigeminal injection with radiographic control. 269 Abstract
Treatment of tic symptoms. 73
NEVUS
Bernier, J. L. and Tiecke, R. W. Nevus of the gingiva. 165
NOVOCAIN: See Anesthesia and anesthetics, local—procaine hydrochloride
NUCLEAR PHYSICS: See Atomic energy

O

OBITUARIES
Bear, Harry. 340 Portrait
Liscom, J. L. 88 Portrait
McFarland, Harry. 88 Portrait
Miller, H. C. 253 Portrait
OBTURATORS AND SIMILAR APPLIANCE
ACRYLIC RESIN
Ward, G. E et al. Use of removable acrylic prosthesis to retain mandibular fragments and adjacent soft tissues in normal position after surgical resection. 267 Abstract
ODONTOMA
Gwinn, C. D. Compound composite odontoma: report of case. 337
OLSON, B. A. President of the American Society of Oral Surgeons. Portrait opp. 3
ORAL SURGERY
Bunnell, Sterling. Teamwork in surgery. 37 Abstract
Dingman, R. O. Practice of oral surgery. (Ed.) 63
Will oral surgery meet the challenge? (Ed.) 162
Oral surgeon's obligation. (Ed.) 251
COURSES: See Education, dental—oral surgery
DIET IN RELATION TO: See Diet and nutrition—oral surgery
INSTRUMENTS
Graitcer, D. L. Diamond bone files versus steel bone files. 175
ORTHODONTIC EDUCATION: See Education, dental—orthodontic
OSTEITIS
DEFORMANS
Koch, W. E., Jr. Bone changes associated with hyperparathyroidism, Paget's disease and osteofibroma. 16
OSTEOMA
Brandon, S. A. Osteoma of the mandible: report of case. 153
OSTEOMYELITIS
Brown, C. J., Jr. Osteomyelitis in fatal lymphatic leukemia: report of case. 245
Egan, G. F. Osteomyelitis of the mandible treated with aureomycin: report of case. 60
Stuteville, O. H. New concept of treatment of osteomyelitis of the mandible. 301
OSTEOTOMY: See Mandible and maxilla—resection

P

PAGET'S DISEASE: See Osteitis—deformans
PAIN
DIAGNOSIS: See also Neuralgia
Epsteen, C. M. Maxillofacial pains simulating trigeminal neuralgia. 114
PALATE, cleft: See Cleft palate and harelip
PARA-CHLOROPHENOL
Para-chlorophenol. 313 Abstract
PAUL, J. K. (Abstracted by.) Evaluation of xylocaine as a new local anesthetic. Matthew Lozier. 266 Abstract
PAYNE, J. T. AND PEARSE, H. E. Burns resulting from atomic bomb explosion. 250 Abstract
PEARSE, H. E. AND PAYNE, J. T. Burns resulting from atomic bomb explosion. 250 Abstract
PELL, G. J. Ameloblastoma of the mandible: report of case. 155
PENICILLIN
Action of penicillin. 73
Kaplan, I. W. and McDonald, R. Penicillin. 173 Abstract
PENTOTHAL SODIUM: See Anesthesia and anesthetics general—thiopental sodium
PEPPER, O. H. P. Medical etymology. (Book rev.) 77
PETTY, C. R. (Abstracted by.) Study of novocain (procaine) sensitivity among Navy dental officers. W. V. Charter, et al. 85
PINCOCK, D. F. Bilateral osteotomy of the rami for agnathic mandible: report of case. 54
PLASMOCYTOMA
Bernier, J. L. and Tiecke, R. W. Plasmocytoma. 70
PLASTIC SURGERY
Bames, H. O. Plastic surgical correction of oral deformities. 143
Letterman, G. S. and Meloy, W. C. Plastic surgery in the United States: a review of the 1948 literature. 266 Abstract
PLASTICS
TISSUE REACTION
LeVeen, H. H. and Barberio, J. R. Tissue reaction to plastics. 62 Abstract
POLYETHYLENE
Grindlay, J. H. Method of making tubes of polyethylene film for use in anastomosis of the common bile duct, trachea, and pelvic colon. 179 Abstract
POSTOPERATIVE COMPLICATIONS AND CARE: See Extraction—postoperative complications and care
PROCAINE HYDROCHLORIDE: See Anesthesia and anesthetics, local—procaine hydrochloride
PROGNATHISM: See Mandible and maxilla—resection

R

RADIATION SICKNESS: See Materia medica and therapeutics

RAKOWER, WILLIAM; SELDIN, H. M. AND SELDIN, S. D. Cleidocranial dysostosis. 236
READER, Z. A. Gingival hyperplasia resulting from diphenylhydantoin sodium: a review of the literature. 25
RESEARCH
DENTAL
New grants for dental research announced. 89
RESECTION OF MANDIBLE: See Mandible and maxilla—resection
RICHARDS, A. G. X-ray protection in dentistry. 323
ROENTGEN RAYS
DANGER FROM USE
Beeler, J. W. et al. New drug in the treatment of radiation sickness. 180 Abstract
Lyon, L. Z. Radiation necrosis of the mandible: report. 159
Richards, A. G. X-ray protection in dentistry. 323
ROENTGENOLOGY
DENTAL
Szerlip, Leonard. Roentgenographic pterygopalatine injection for t maxillary nerve. 327
ROENTGENOTHERAPY
Doane, H. F. Radiologic management nant oral lesions. 133
ROSENTHAL, NATHAN AND DRESKIN, O. H. ophilia-like disease with prolonged coagulation time and a circulating anticoagulant: report of a case in a female. 270
ROVENSTINE, E. A. AND HERSHEY, S. G. Anesthetic management of patients with fracture of the mandible. 82 Abstract
RUTIN: See Hemorrhage—control

S

SALIVARY GLANDS
Sparkman, R. S. Primary repair of severed parotid duct. 269 Abstract
DISEASES
Hird, A. J. Mikulicz's syndrome. 270 Abstract
TUMORS: See Tumors
SALTER, W. T. AND WHITE, MARY LOUISE. Morphine "sensitivity." 268 Abstract
SCHAEFER, J. E. AND JOHNSON, O. K. (Reviewed by.) Surgeon's guide to local anesthesia—a manual of shockless surgery. C. E. Corlette. 264
SCHRAM, W. R. (Reviewed by.) Cancer of the head and neck. Hayes Martin. 265
SCLEROSING AGENTS
Function of a sclerosing agent. 349
SELDIN, H. M.; SELDIN, S. D. AND RAKOWER, WILLIAM. Cleidocranial dysostosis. 236
SELDIN, S. D.; RAKOWER, WILLIAM AND SELDIN, H. M. Cleidocranial dysostosis. 236
SHARP, G. S. AND WOOD, R. C. Treatment of cancer of the gums. 185
SHARP, G. S. et al. Irradiation as the preferred treatment of cancer of the lip. 270 Abstract
SLERODERMA: See Systemic conditions manifested in mouth—scleroderma
SELTZER, A. P. Plastic surgery of the nose. (Book rev.) 79
SHACKELFORD, R. R. AND BROWN, W. H. Restricted jaw motion due to osteochondroma of the coronoid process. 86 Abstract
SICHER, HARRY. Oral anatomy. (Book rev.) 76
SINUSES OF FACE: See Maxillary sinus
SLEEPER, H. R. AND THOMPSON, E. C. General anesthetic methods with special reference to thiopental sodium. 121
SMITH, A. E. Appointed professor of Reconstructive Plastic, Maxillofacial and Oral Surgery at the University of Southern California School of Dentistry. 89
SMITH, J. B. Temporomandibular ankylosis. 297
SODEN, W. H. (Edited by.) Rehabilitation of the handicapped. A survey of means and methods. (Book rev.) 352
SOUTHEASTERN SOCIETY OF ORAL SURGEONS Annual meeting. 91; 271
SPARKMAN, R. S. Primary repair of severed parotid duct. 269 Abstract
STRAITH, C. L. AND LEWIS, J. R. Ankylosis of the temporomandibular joint. 87
STRAITH, CLAIRE L. Mortised mandibular bone graft following giant cell tumor removal. 269 Abstract
STREAN, L. P. Oral bacterial infection. (Book rev.) 78
STOUT, R. A. Appointed to staff of University of Texas. 89
Blocker, T. G. Mandibular reconstruction, World War II. 86
STUTEVILLE, O. H. New concept of treatment of osteomyelitis of the mandible. 301
SUBLUXATION OF MANDIBLE: See Dislocation of mandible
SULFONAMIDES
Flippin, H. F. and Boger, W. P. Recent advances in antibiotic and sulfonamide therapy. 83 Abstract
SURGERY
ORAL: See Oral surgery
PLASTIC: See Plastic surgery
SWEET, W. H. Trigeminal injection with radiographic control. 269 Abstract
SWELLINGS OF FACE AND NECK
Evaluation of postoperative swelling. 263
SYSTEMIC CONDITIONS MANIFESTED IN MOUTH
CLEIDOCRANIAL DYSOSTOSIS
Seldin, H. M.; Seldin, S. D. and Rakower, William. Cleidocranial dysostosis. 236
DIABETES: See Diabetes and dentistry
LEUKEMIA
Brown, C. J., Jr. Osteomyelitis in fatal lymphatic leukemia: report of case. 245
SCLERODERMA
Krogh, H. W. Dental manifestation of scleroderma: report of case. 242
SZERLIP, LEONARD. Roentgenographic study of the pterygopalatine injection for blocking the maxillary nerve. 327

T

TEETH
CUSPIDS
Crich, W. A. Aberrant maxillary cuspid with complications: report of case. 157
EXTRACTION: See Extraction
IMPACTED: See also Extraction—impacted teeth
Crich, W. A. Aberrant maxillary cuspid with complications: report of case. 157
MOLARS, FIRST PERMANENT
Apfel, Harland. Autoplasty of enucleated prefunctional third molars. 289
MOLARS, THIRD: See also Extraction—impacted teeth
Apfel, Harland. Autoplasty of enucleated prefunctional third molars. 289
Atkinson, S. R. Third molar problem. 136
TELANGIECTASIS: See Hemorrhage—control
TEMPOROMANDIBULAR JOINT
DISEASES
Smith, J. B. Temporomandibular ankylosis. 297
Straith, C. L. and Lewis, J. R. Ankylosis of the temporomandibular joint. 87
McKelvey, L. E. Sclerosing solution in the treatment of chronic subluxation of the temporomandibular joint. 225
THIOPENTAL SODIUM: See Anesthesia and anesthetics, general—thiopental sodium
THIRD MOLARS: See Teeth—molars, third; See also Extraction—impacted teeth
THYROID DISORDERS: See Endocrine glands in relation to oral conditions
THOMPSON, E. C. AND SLEEPER, H. R. General anesthetic methods with special reference to thiopental sodium. 121
TIC DOULOUREUX: See Neuralgia—trigeminal; trifacial; tic douloureux
TIECKE, R. W. AND BERNIER, J. L. Adeno-ameloblastoma. 259
Biopsy. 342
Fibrous dysplasia. 256
Hemangioma of the lip. 67
Hemangioma of the parotid gland. 171
Incisive canal cyst. 254
Nevus of the gingiva. 165
Plasmocytoma. 70
Squamous cell carcinoma involving the periodontal membrane. 65

TRIFACIAL NEURALGIA: See Neuralgia—trigeminal; trifacial; tic douloureux
TRIGEMINAL NEURALGIA: See Neuralgia — trigeminal; trifacial; tic douloureux
TRUEX, R. C. AND KELLNER, C. E. Detailed atlas of the head and neck. (Book rev.) 80
TUMORS
See also names of tumors
Baumgartner, C. J. Differential diagnosis of tumors of the neck. 50
Berger, Adolph. Mixed tumors of the palate. 208
Bernier, J. L. and Tiecke, R. W. Mixed tumor of the parotid gland. 167
Mammel, C. K. Peripheral and central giant cell tumors of the head region. 38

V

VINCENT'S INFECTION
Treatment of Vincent's infection. 350
VITAMINS
Hirschi, R. G. Postextraction healing in vitamin A deficient hamsters. 3
Clinical value of vitamin B_{12}. 74

W

WALDRON, C. W. (Reviewed by.) Detailed atlas of the head and neck. R. C. Truex and C. E. Kellner. 80
Medical etymology. O. H. P. Pepper 77
Oral anatomy. Harry Sicher. 76
Plastic surgery of the nose. A. P. Seltzer. 79
Surgical and maxillofacial prosthesis. O. E. Beder. 176
WALDRON, C. W. et al. Fundamentals in the surgical treatment of mandibular prognathism. 179 Abstract
WARD, G. E. et al. Use of removable acrylic prosthesis to retain mandibular fragments and adjacent soft tissues in normal position after surgical resection. 267 Abstract
WARD, T. G. AND MOORE, F. T. Complications and sequelae of untreated fractures of the facial bones and their management. 178 Abstract
WEST VIRGINIA SOCIETY OF ORAL SURGEONS
Elects new officers. 272
WHEELER, R. C. Textbook of dental anatomy and physiology. (Book rev.) 351
WHEELOCK, R. W. Open reduction of fractured mandible: report of case. 247
WHITE, MARY LOUISE AND SALTER, W. T. Morphine "sensitivity." 268
WINTER, LEO: See Leo Winter Memorial Meeting
WOLF, STEWART AND WOLFF, G. H. Pain. (Book rev.) 76
WOLFF, H. G. AND WOLF, STEWART. Pain. (Book rev.) 76
WOOD, R. C. AND SHARP, G. S. Treatment of cancer of the gums. 185
WOODWARD, C. M. Appointed professor of Oral Surgery at University of Southern California School of Dentistry. 89
WOUNDS AND INJURIES
HEALING
Hirschi, R. G. Postextraction healing in vitamin A deficient hamsters. 3

X

XYLOCAINE: See Anesthesia and anesthetics, local —lidocaine hydrochloride
X-RAY: See Roentgen rays; Roentgenology; Roentgenotherapy

Z

ZYGOMA: See Fractures—jaws

Editorial communications

■ ORIGINAL COMMUNICATIONS—This journal invites concise original contributions in the broad field of clinical and experimental surgery of the mouth and associated structures, including roentgenology, diagnosis, anesthesia and oral surgical pathology. Articles are accepted for publication with the understanding that they are contributed solely to the JOURNAL OF ORAL SURGERY. All manuscripts are subject to editorial modification. Neither the editors nor the publishers accept responsibility for the views and statements of authors expressed in their communications.

■ MANUSCRIPTS—Manuscripts submitted for publication should be sent to Reed O. Dingman, Editor, 221 North Ingalls Street, Ann Arbor, Michigan.

Manuscripts should be typewritten on one side of the paper only, with double spacing and liberal margins. The author's name and the abbreviated title of the article should appear at the top of each manuscript page. The original should be sent to the editor and a carbon copy retained by the author. Manuscripts will not be returned if accepted for publication.

References should be placed at the end of the article and should conform to the style of the Quarterly Cumulative Index Medicus; viz., name of author, title of article and name of periodical with volume, pages, month and year. They should be numbered and should appear in the same order as that of the superior figures inserted in the appropriate positions in the text.

■ ILLUSTRATIONS—Illustrations accompanying manuscripts should be unmounted and numbered. The author's name should appear on the margin or back.

Authors should insert figure numbers at appropriate places in the text. The original drawings, or glossy print photographs of them, should accompany the manuscript. Legends for illustrations are to be typewritten in a separate list with numbers corresponding to those on the photographs and drawings.

A reasonable number of halftone illustrations will be reproduced free of cost to the author, but special arrangements must be made with the editors for color plates, elaborate tables or extra illustrations. Copy for zinc cuts (such as pen drawings and charts) should be drawn and lettered in India ink or with black typewriter ribbon (carbon paper placed with carbon against back of sheet for bolder type). Ordinary blue or colors will not reproduce. Only good photographic prints or drawings should be supplied for halftone work.

■ CASE REPORTS—Case reports will constitute an important department of the journal and the editors welcome case reports that are of unusual clinical value or that present exceptional conditions of interest to dental surgeons.

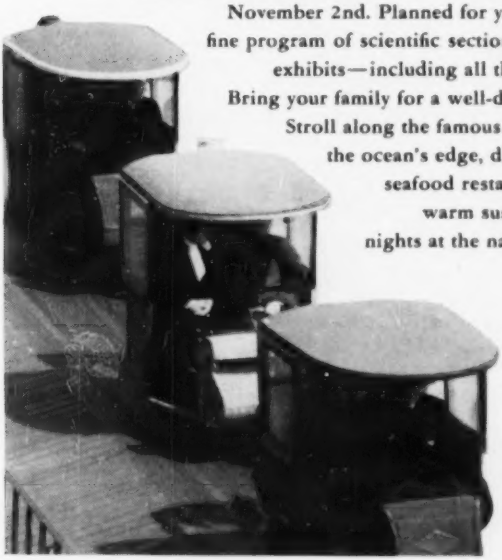
■ EXCHANGES—Letters, exchanges, reprints and all other communications relating to the JOURNAL OF ORAL SURGERY should be sent to the American Dental Association, 222 East Superior Street, Chicago 11.

Come to Atlantic City

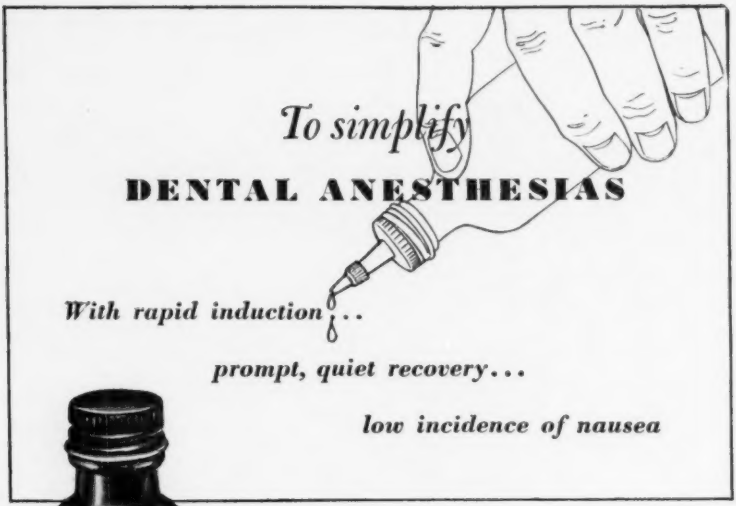
October 30th – November 2nd

– for the A. D. A.'s 91st Annual Session

You'll get a healthful lift from the invigorating sea air at Atlantic City this Fall . . . and return home refreshed mentally and physically. For here in this delightful Bagdad-by-the-Sea, the 91st Annual Session of the American Dental Association will be held from October 30th through November 2nd. Planned for you is an exceptionally fine program of scientific sections, clinics and commercial exhibits—including all that's new in dentistry today. Bring your family for a well-deserved vacation. Stroll along the famous boardwalk, ride along the ocean's edge, dine in a world renowned seafood restaurant and enjoy the warm sunny days and cool, starlit nights at the nation's leading seaside resort.



Make Reservations Now! Use Official Application Form in the Journal of the A. D. A.



To simplify

DENTAL ANESTHESIAS

With rapid induction . . .

prompt, quiet recovery . . .

low incidence of nausea

VINETHENE is a preferred inhalation anesthetic for use in extraction of teeth and other dental operations of short duration.

Literature will be mailed upon request.

MERCK & CO., INC
Manufacturing Chemists
RAHWAY, NEW JERSEY

Vinethene®

(VINYL ETHER FOR ANESTHESIA U. S. P. MERCK)

An Inhalation Anesthetic for Short Operative Procedures

COUNCIL ACCEPTED

BETTER CLINICAL PHOTOGRAPHY...

THE Quick-Clix* WAY

...SIMPLE AS A B C

A Set the lens for the distance you desire — for close-ups (as close as 2 inches) or for longer focus.

B Click the handy thumb switch for dim illumination and focus the image sharply in the viewer.

C Click the switch again for full photographic illumination and press the camera release.

That's all there is to **better clinical photography** the "Quick-Clix" way. With the "Quick-Clix," designed for use with any single lens Reflex camera, such as the Kine Exakta, you see what you want and photograph exactly what you see in the viewer (without parallax) . . . minute details of surface conditions or interior aspects of body cavities . . . close-ups as close as 2 inches or longer focus . . . sharp black-and-whites or faithful, brilliant reproductions in full color.

"Quick-Clix" combines the camera mount, twin light sources, and handy fingertip controls—all in a compact, light-weight, inexpensive unit . . . sturdily constructed for years of trouble-free service . . . dignified and professional in appearance.

"Quick-Clix" is designed to make clinical photography so easy and simple that you will want to use it routinely in your practice for making accurate, permanent records of visual clinical findings . . . particularly for compensation cases, for clinical lectures, papers, and demonstrations, for recording progress of corrective procedures in cases of traumatic and congenital deformities, structural defects, reconstructions, and many other conditions.

* Patent Pending

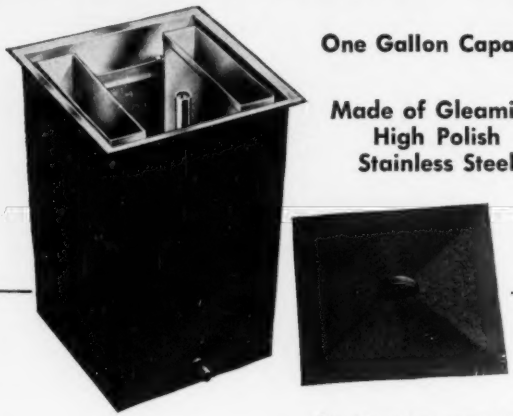
Write for complete professional folder, price list of "Quick-Clix" and accessories, and details of **guarantee**. Look for the "Quick-Clix" booth at leading medical and dental conventions.

Telephone: PLaza 3 { 8595 / 8247

WALDEN INDUSTRIES, Inc.
74 W. 52nd St. - New York 19, N. Y.

Cable Address: WALDENCO

RINN'S NEW PROCESSING TANK



One Gallon Capacity

Made of Gleaming High Polish Stainless Steel

Complete with 2 removable tanks and light-tight cover **$69.50**

FAST, ACCURATE TEMPERATURE CONTROL

EXTREMELY HIGH THERMAL CONDUCTIVITY saves time in waiting for solutions to reach proper processing temperatures. Removable standpipe drain for fast drainage.

EASY TO CLEAN AND MAINTAIN. Water jacket coated with wrinkle-finish paint to prevent condensation and sweating.

EASILY INSTALLED. Only two simple plumbing connections needed. Complete diagram with each unit.

INSERT TANKS

$16.50 each

Insert Tanks may be used in old rubber jackets

RINN X-RAY PRODUCTS, Inc. 2929 N. Crawford Ave. Chicago 41

X-RAY FILMS • FILM MOUNTS • TIMERS • THERMOMETERS • CHEMICALS • ACCESSORIES

fR PREPARED LIQUID X-RAY DEVELOPER and ACID FIXER WITH HARDENER

Today the *last word* in X-ray developing and fixing chemicals producing radiographs of exact detail, proper contrast, full tonal graduation. Extreme developing latitude assures uniform results no matter what make of X-ray film is used.

Graduated for convenience!

Light-proof for long life!

Don't take chances— Be sure with fR

DENTISTS

AUTO DISPLAY PLATES

Made of steel; enamel finish. Glossy, durable. Green Caduceus, lettering and border on White field. Size 2¾" x 4¾".

Price: $3.00 Per Pair, postpaid

Satisfaction guaranteed or money cheerfully refunded!

Send today to

CROSS EMBLEM CO.

11 W. 42nd St. (Dept. OS 1050)
New York 18, N.Y.

INDEX TO ADVERTISERS

American Dental Association A-1

Cook-Waite Laboratories, Inc. A-6

Cross Emblem Co. A-5

FR Corp. A-5

Merck & Co., Inc. A-2

Rinn X-Ray Products, Inc. A-4

Walden Industries A-3

BACK AGAIN!

Sure... my dentist doesn't hurt!

How about *your* patients, doctor? Are they equally confident? They will be — if you'll use Novocain-Pontocaine-Cobefrin wherever indicated. Elimination of dental pain by *any* means is well worth while . . . but what simpler, more economical way than by use of this fine local anesthetic solution? "N.P.C.'s" deep, dense anesthesia provides the sort of lasting protection which helps free patients from fear of dental pain. Once rid of *that* bugaboo, they'll be more receptive to plans for proper tooth care. They'll be grateful, too . . . and it's on just such patient-gratitude that better practices are built.

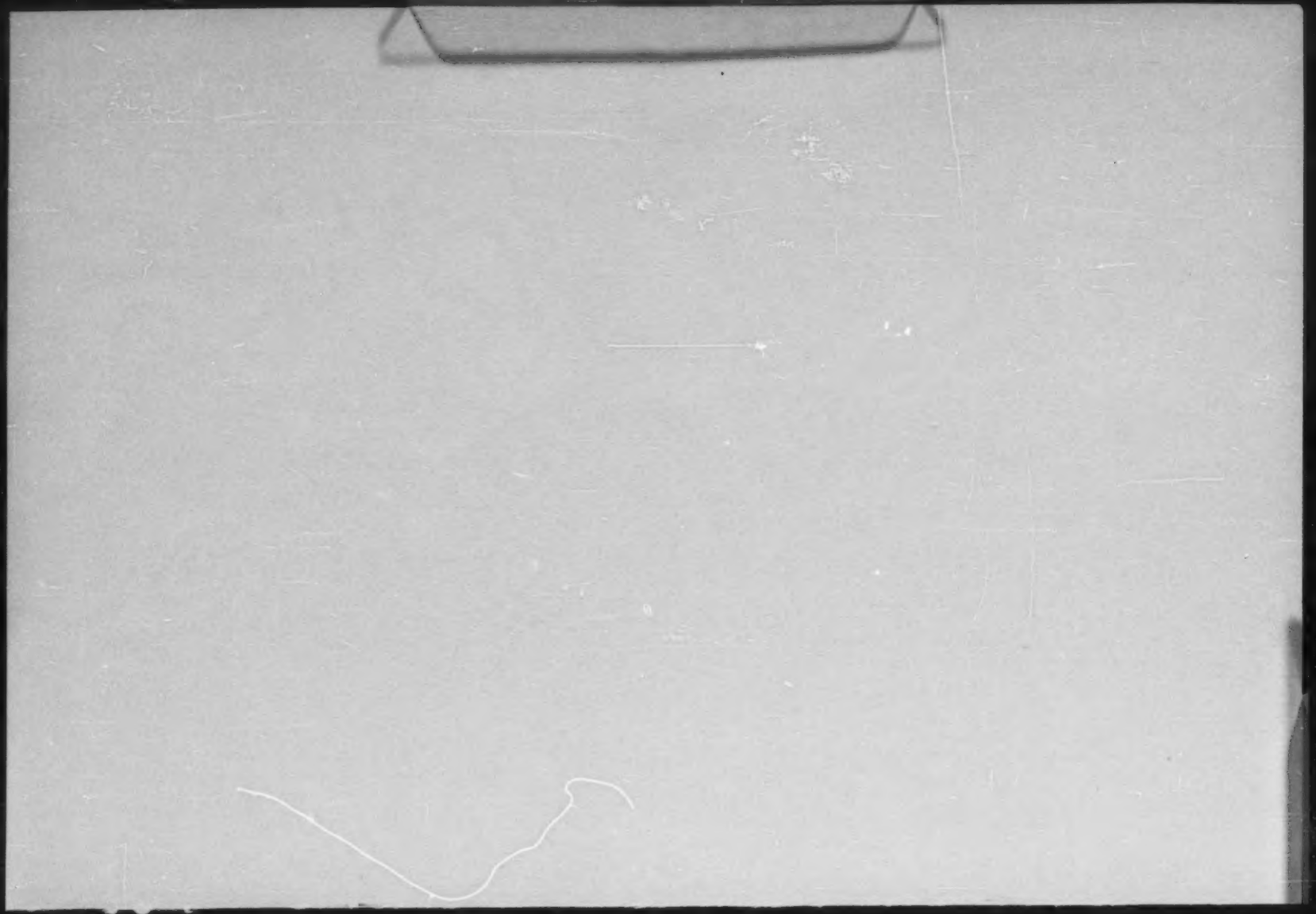
npc

"the Difference is Distinctive"

COOK-WAITE *Laboratories, Inc.*

1450 Broadway, New York 18, N. Y.

Cobefrin, Novocain, Pontocaine, Trademarks (Reg. U. S. Pat. Off. & Canada) Winthrop-Stearns Inc.



JOURNAL OF ORAL SURGERY

VOL. 9

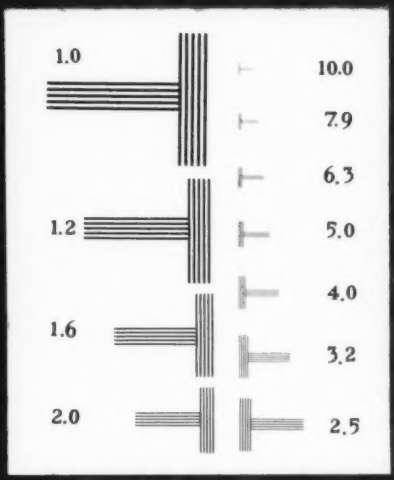
NOS. 1 – 4

1951

PUB. 601

UNIVERSITY MICROFILMS
ANN ARBOR, MICHIGAN. 1951

RESOLUTION CHART



100 MILLIMETERS

INSTRUCTIONS Resolution is expressed in terms of the lines per millimeter recorded by a particular film under specified conditions. Numerals in chart indicate the number of lines per millimeter in adjacent "T-shaped" groupings.

In microfilming, it is necessary to determine the reduction ratio and multiply the number of lines in the chart by this value to find the number of lines recorded by the film. As an aid in determining the reduction ratio, the line above is 100 millimeters in length. Measuring this line in the film image and dividing the length into 100 gives the reduction ratio. Example: the line is 20 mm. long in the film image, and $100/20 = 5$.

Examine "T-shaped" line groupings in the film with microscope, and note the number adjacent to finest lines recorded sharply and distinctly. Multiply this number by the reduction factor to obtain resolving power in lines per millimeter. Example: 7.9 group of lines is clearly recorded while lines in the 10.0 group are not distinctly separated. Reduction ratio is 5, and $7.9 \times 5 = 39.5$ lines per millimeter recorded satisfactorily. $10.0 \times 5 = 50$ lines per millimeter which are not recorded satisfactorily. Under the particular conditions, maximum resolution is between 39.5 and 50 lines per millimeter.

Resolution, as measured on the film, is a test of the entire photographic system, including lens, exposure, processing, and other factors. These rarely utilize maximum resolution of the film. Vibrations during exposure, lack of critical focus, and exposures yielding very dense negatives are to be avoided.

THIS PUBLICATION IS REPRODUCED BY AGREEMENT WITH THE COPYRIGHT OWNER. EXTENSIVE DUPLICATION OR RESALE WITHOUT PERMISSION IS PROHIBITED.